MAY, 1925

Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
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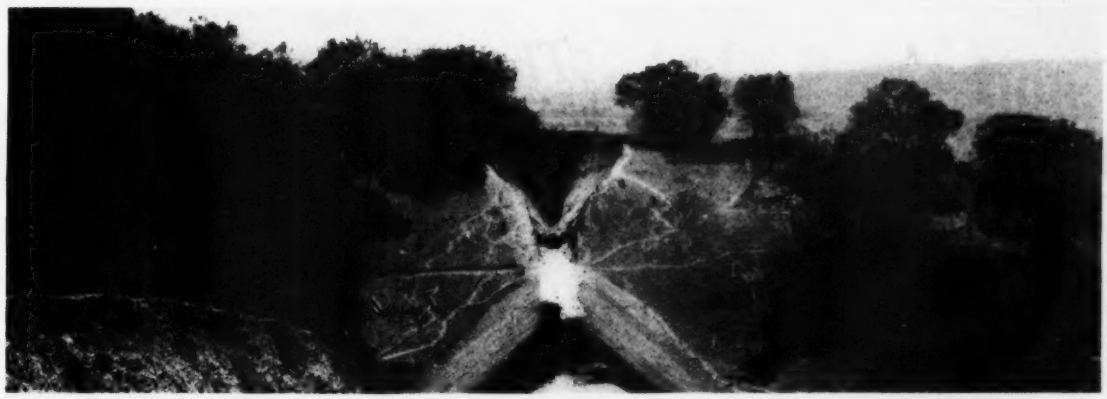

Grading on the Southern Pacific of Mexico between Tepic and La Quemada

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 21 **May, 1925** **Number 5**

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WOULD YOU LIKE TO KNOW

How to lay out suction lines to take water from a river subject to sand flows?
How to handle embankments during the period of settlement?
What loss of section may be expected in creosoted bridge timbers subjected to a fire?
The relative effect of weed killing chemicals in rock and earth ballasted tracks?
How to stop sand flows in tunnel construction?

Answers to these and other questions will be found in this issue.

Published on the last Thursday preceding the date of issue by the

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In sending us change of address please be sure to send us your old address as well as the new one.

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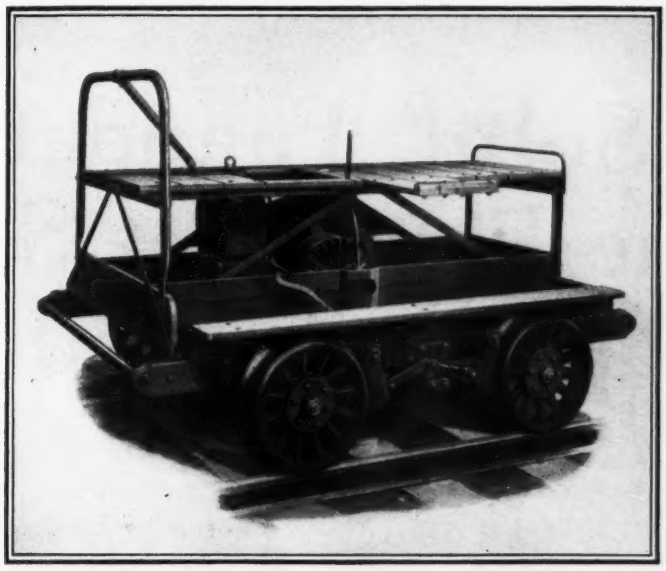


The New Fairbanks-Morse "44" Motor Car

Try to burn out this *clutch!*

Of course you realize the advantages of a chain driven motor car—you who have struggled with broken belts and tugged for hours at *belt tightener* levers.

For the first time in railway service there has been developed a satisfactory clutch and chain driven motor car—a car with a clutch that cannot be burned out. Large faces with cooling fins that dissipate the heat have made this a reality.

And the result is perfect clutch control that brings out the full advantages of chain drive—the drive that eliminates the sliding engine base or belt tightener, and the strains on crankshaft and car that are inescapable when the car is belt driven.

The same finely worked out design and construction is found in every other detail of the new 44. It has a fully accessible engine, bolted tight to a pressed steel automobile type frame; a high safety rail as standard equipment; exceptionally light weight for a car of its ruggedness; and above all, *full power at the wheels.*

The new 44 is simply the newest addition to the long series of cars that have been setting the standard for section car development ever since Fairbanks-Morse built the first motor driven car over 30 years ago. Another recent development is the Sheffield 40-B. This car supersedes the popular Sheffield 40, retaining the good features of the former model and adding refinements that will win still more friends.

Our representative will give you complete information covering the 44, the 40-B or any of the reliable railway equipment listed below—or you may write for bulletins.

Coaling Stations

The finest of equipment, backed by individual responsibility, permanently guarantees every coaling station that is

— built throughout by Fairbanks-Morse

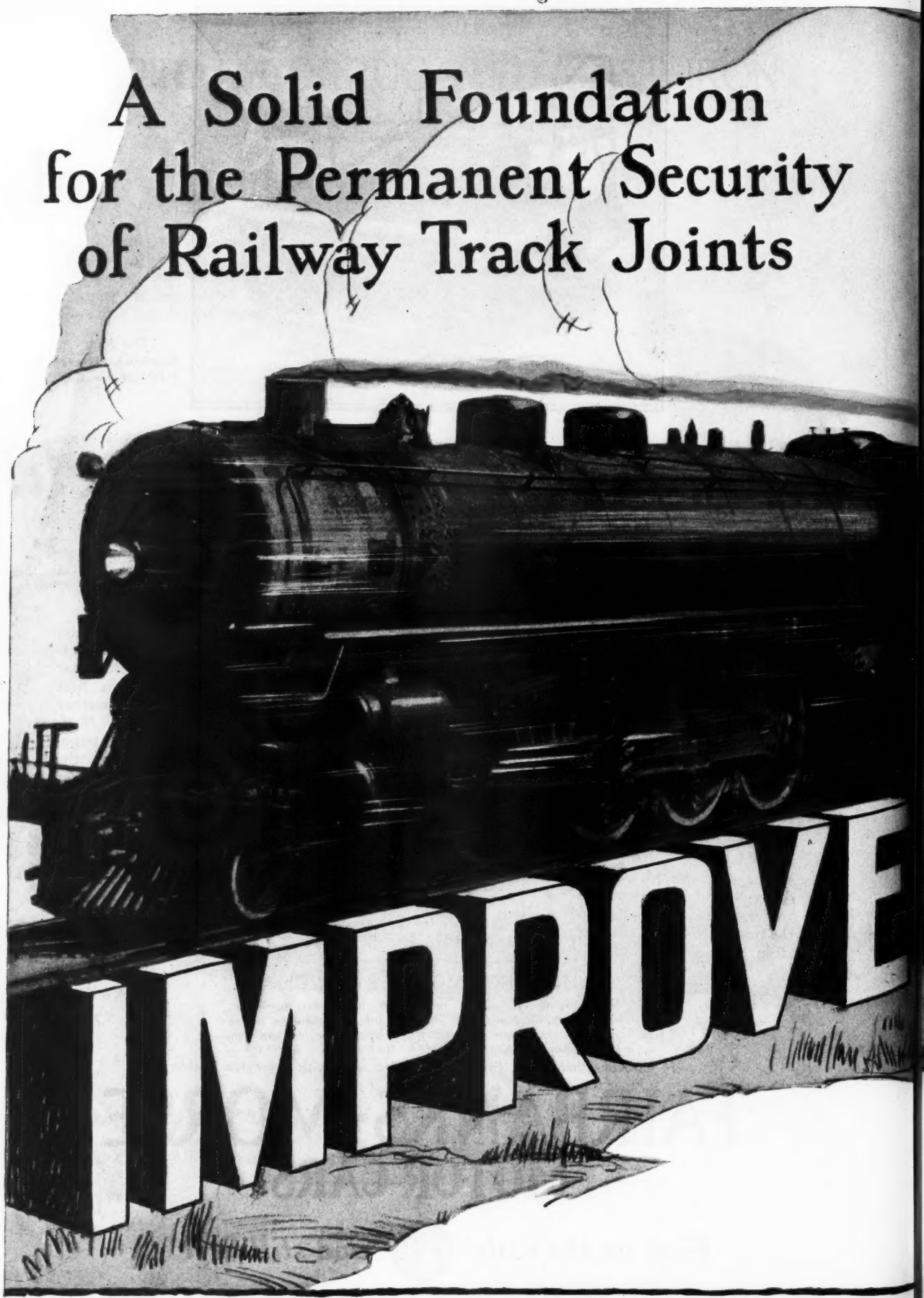
FAIRBANKS, MORSE & CO., Chicago

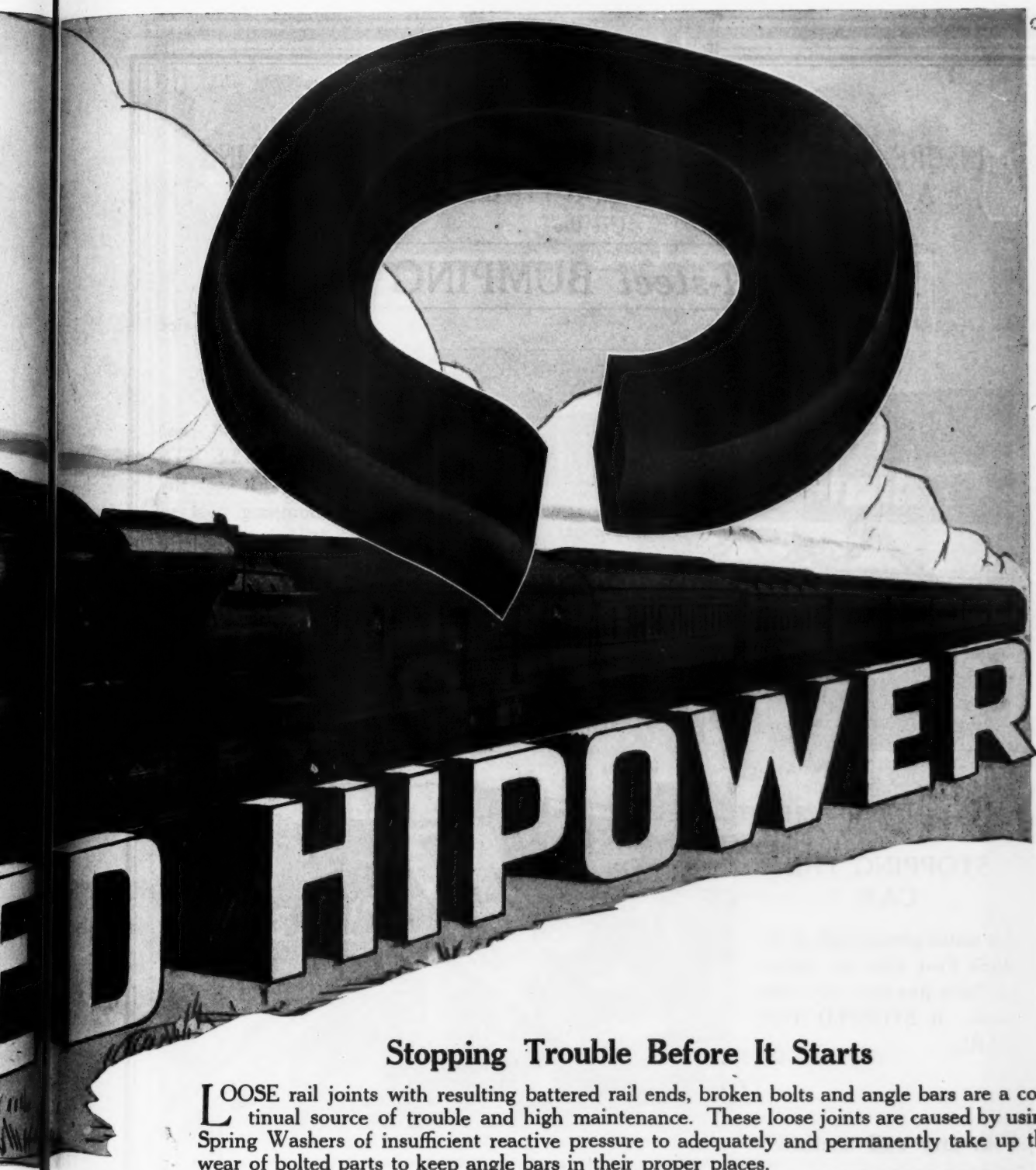
Manufacturers of railway motor cars, hand cars, push cars, velocipedes, standpipes for water or oil, tank fixtures, oil engines; steam, power and centrifugal pumps; scales, and complete railway coaling stations.

24 branches throughout the United States, each with a service station.

FAIRBANKS-MORSE
MOTOR CARS

First on the rails F M ***and still first***


A Solid Foundation
for the Permanent Security
of Railway Track Joints
IMPROVE



Stopping Trouble Before It Starts

LOOSE rail joints with resulting battered rail ends, broken bolts and angle bars are a continual source of trouble and high maintenance. These loose joints are caused by using Spring Washers of insufficient reactive pressure to adequately and permanently take up the wear of bolted parts to keep angle bars in their proper places.

Far sighted engineers stop this damage before it starts by the use of IMPROVED HIPOWER, the non flattenable Spring Washer.

This unique device with its enormous reactive pressure keeps bolts tight. As slight wear occurs—IMPROVED HIPOWER forces the angle bar snug under the rail head to assure tight joints, the kind which approach the ideal condition of a continuous rail.

The National Lock Washer Company

Newark, N. J., U. S. A.

Guarantee

Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—

— or —

Write your own guarantee!

OWEN BUCKET CO.

A Mouthful at Every Bite

An Owen Bucket is very fittingly compared with a bull dog. Its tenacious grip tears the material from pile or ground as the bull dog tears the jugular from its victim—a mouthful at every bite.

It is not hard to understand this fact. Owen Buckets are built on the broad and simple principle of correct distribution of weight and properly applied leverage. Owen Buckets are mathematically correct in design and construction and their practicability has been proven under the most adverse conditions.

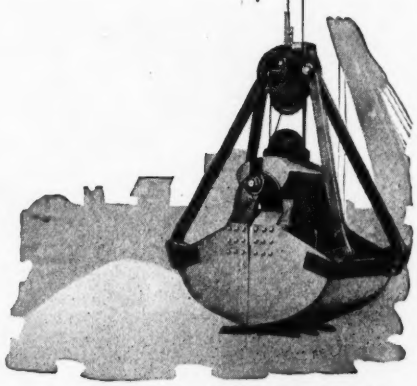
See for yourself. Folder 2-A tells how 60% of the weight is concentrated in the center where it holds the bucket down while the jaws "dig in." It also tells about the "cushion stop" on the counterweight that permits the bucket to hit the material *"cutting edges first"* without breakage.

It is easy to understand why "Owen" superiority will save money and make money for you.

Why not look it over? Send for folder 2-A.

The Owen Bucket Company

505 Rockefeller Building Cleveland, Ohio



A ¾-yard Type "J" Bucket. One of two Owen Buckets used by the Cuyahoga Paving Co., Cleveland, Ohio, at their asphaltum plants. These buckets handle sand and crushed stone from the pit into which the cars dump their material.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

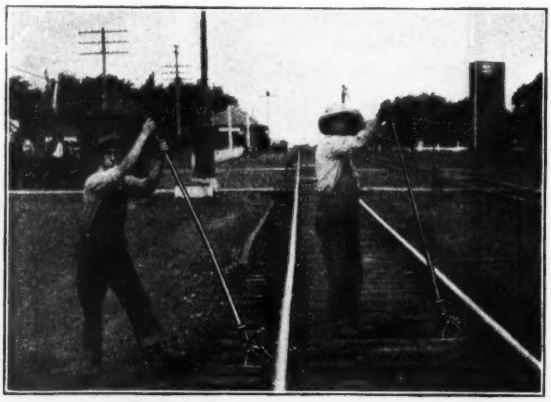
Owen Buckets

INSURE A BIGGER DAY'S WORK

The Giant Track Liner

More Power Exerted in the Right Direction

Open Position



The Giant Track Liner is not a theory. It was developed by a practical roadmaster on a large railroad system and has proved its superiority in actual service.

The GIANT Track Liners are real labor- and time-saving devices that will pay for themselves in an unusually short time and no section should be without them.

They are a necessity on sections that are under-manned, as two men with two GIANT Track Liners can line a track that might otherwise be left in an unsafe condition, due to lack of a sufficient crew to do the work with ordinary lining bars.

Proof that two men with two GIANT Track Liners can line a track that requires three or four of other makes, and that four men with four GIANT Track Liners can line a frog or switch that requires six or seven of other makes, is all that should be necessary to warrant the adoption of the GIANT track Liner as a standard tool for all sections.

The time of the additional men necessary to operate the extra Track Liners when other makes are used and the cost of additional Track Liners for equipping the different sections is too big an item to be overlooked.

The GIANT Track Liner is operated by *pulling down* on the lever. This is a big advantage, as the operator can apply a greater load with less possibility of accident. There is no danger of the GIANT Track Liner slipping out from under the rail and throwing the operator.

The load is directly downward on the base of the GIANT Track Liner which prevents it from kicking away from the rail.

There is nothing about the GIANT Track Liner to get out of working order. It is simple in construction, easy to operate, and small enough to be carried on section handcars or motor cars without difficulty.

Manufactured and sold exclusively by

Gustin-Bacon Manufacturing Company

Kansas City **Philadelphia**

Write for further Information

A Necessity
Not a Luxury—

NOW USED BY MANY LEADING RAILROADS BECAUSE IT—

Throws Without Lifting. Clears a Passing Train. Makes Track Lining Easy. Requires Only One Seating. Releases Men for Other Work. Is Used in Any Kind of Ballast. Does With One Man the Work of Four Men With Bars. Concentrates Force for Lining Kinks, Switches, Etc. Enables Each Section Gang to Keep Its Own Track Lined.

The Rail Joint Company
61 Broadway New York

"RAJO"

Releases two men out of five for other work

Simplifies work of lining track

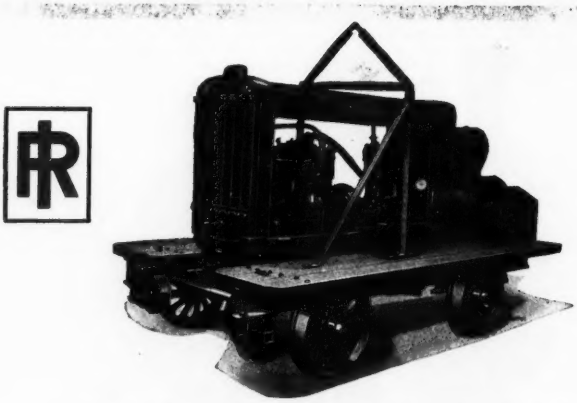
"RAJO" TRACK LINER

Four Ingersoll-Rand Tie Tampers at work. Note the easy operation of the tampers and how the workmen stand in a nearly upright position

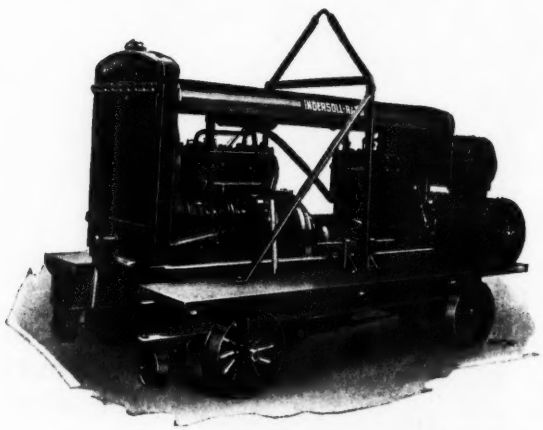
Portable Air Power Units for Tie Tamping, Rail Laying Operations, Bridge Repair, Etc.

Ingersoll-Rand Tie Tamper Compressors are handy, reliable air power units for use any where along the line. They make it possible to speed up the work and reduce the costs on dozens of operations. Ask for complete information.

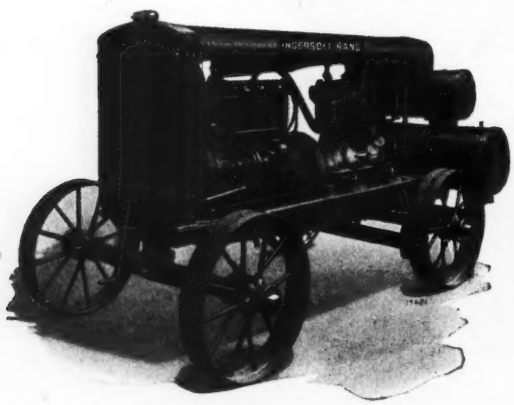
INGERSOLL-RAND COMPANY-11 BROADWAY NEW YORK CITY
Offices in principal cities the world over
FOR CANADA REFER-CANADIAN INGERSOLL RAND CO LIMITED, 260 ST JAMES STREET MONTREAL QUEBEC.



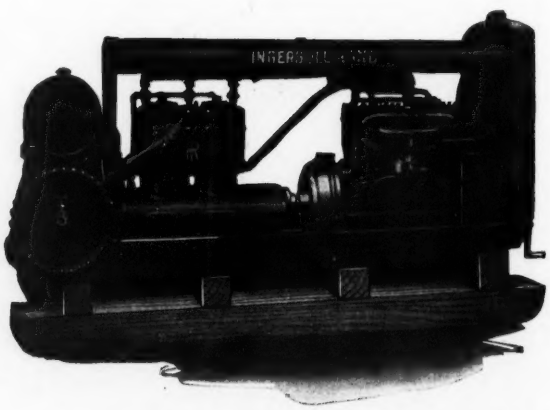
Gasoline Engine Driven Compressor Car on flanged wheels. Size 5"x5" Type Twenty. Operates four pneumatic tie tampers.



9"x8" Type Twenty Gasoline Engine Driven Compressor Car on flanged wheels. Shown with self-propelling mechanism. Will operate 12 pneumatic tie tampers.



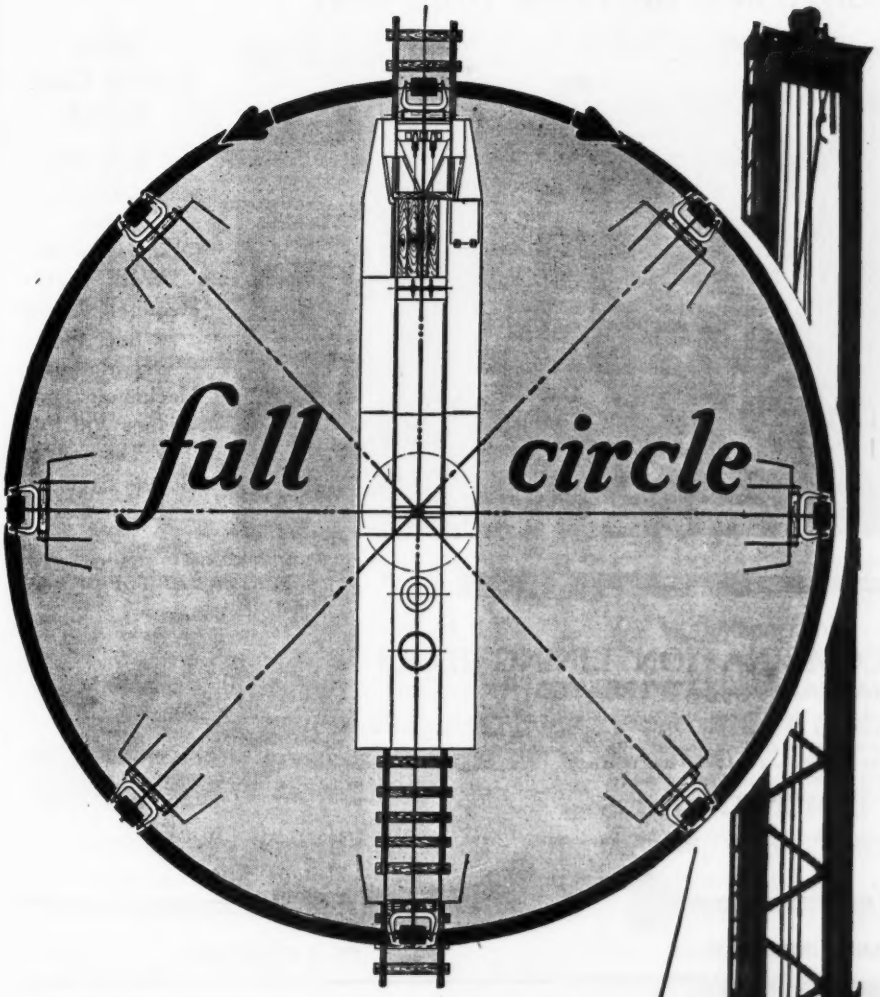
7"x6" Type Twenty Gasoline Engine Driven Compressor mounted on steel wheels and steel axles.



9"x8" Mounted on wooden skids for semi-permanent work or for mounting in a truck or on a car.

Ingersoll-Rand

No. 14 Pile Driver



Specifications

Engines—hoisting 10″ x 10″; travel and swing 10″ x 10″.

Boiler—horizontal 60″x12′5″, 194 2″ tubes, working pressure 175 lbs.

Trucks—capacity 150,000 lbs., journals 6″ x 11″.

Travel Speeds—fast 20 m. p. h., slow 7½ m. p. h.

Draw bar pull—slow speed 10,000 lbs., sluing speed 1 rev. per min.

Single line pull—pile 10,000 lbs., hammer 10,000 lbs.

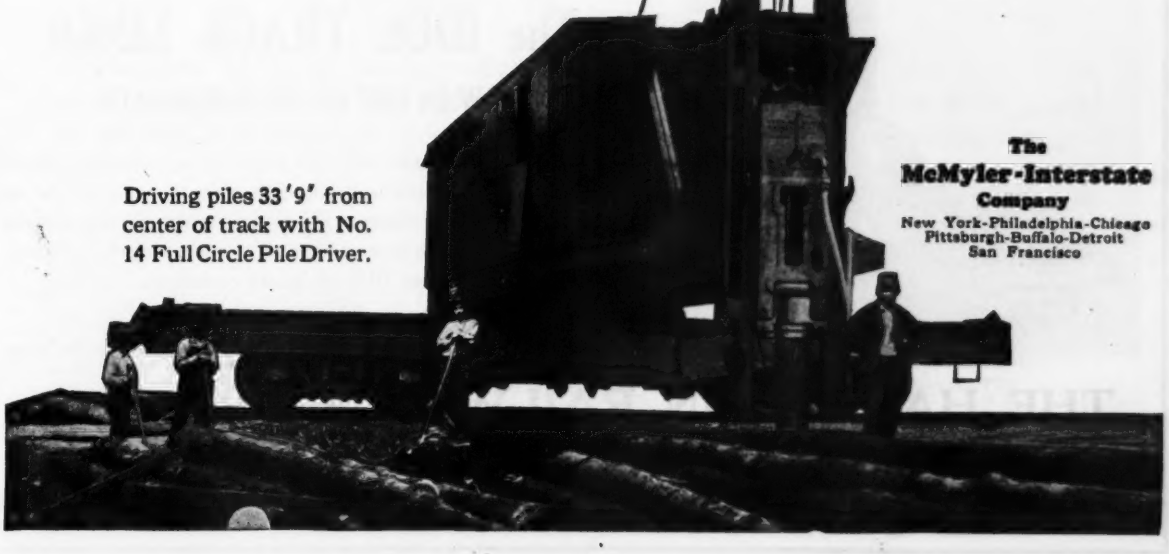
Single line speed—pile 225 ft. per min., hammer 225 ft. per min.

Height of leads—42 ft.

Batter limits—2″ in 12″.

Weight—shipping, not including hammer 186,000 lbs., operating, not including hammer 206,000 lbs.

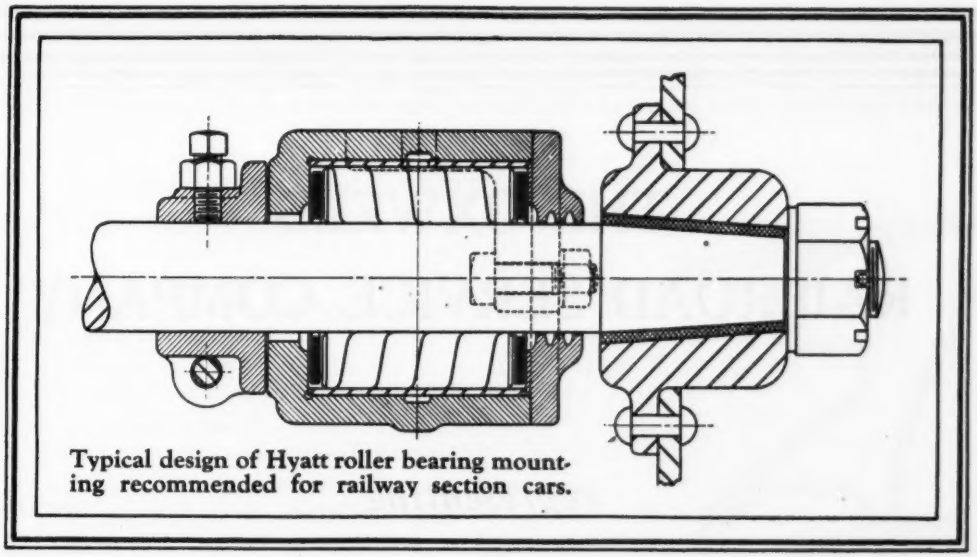
Brakes—complete locomotive type air brakes.



Driving piles 33′9″ from center of track with No. 14 Full Circle Pile Driver.

The McMyler-Interstate Company

New York-Philadelphia-Chicago
Pittsburgh-Buffalo-Detroit
San Francisco



Typical design of Hyatt roller bearing mounting recommended for railway section cars.

Sturdy Hyatt Bearings Speed Up Roadbed Repairs

BETTER business means heavier demands on your rolling stock, more wear and tear on your roadbed and a greater need for dependable section cars.

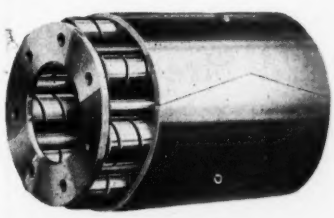
Section cars equipped with Hyatt roller bearings will give years of long wear and freedom from care.

Made of special steel and of simple construction these bearings are built to stand the wear and tear of daily use and the shocks of overloads. The elimination of plain bearing friction and the positive lubrication give ease of running and long life.

Hyatt bearings in your maintenance cars make fewer car inspections necessary, cut lubrication requirements and eliminate bearing adjustments.

For over fifteen years Hyatt bearings have been helping railroad men to solve their maintenance problems. The leading car manufacturers build them into new cars and are prepared to supply replacement boxes to bring your plain bearing cars up-to-date.

For long wear without care insist upon Hyatt bearing equipped section cars.



Long wearing Hyatt bearings are now successfully applied to passenger and freight cars. *Write for the latest information.*

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
PITTSBURGH CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS

Conserve Track Labor *and* Reduce Weeding Costs 66%

"HERBICIDE"

The Weed Exterminator

makes this possible because extensive mileage may be treated in a short space of time with no hand labor involved, at a cost of about $35.00 per mile, or approximately 1/3 the cost of a single hand-weeding.

Hand Weeding Retards Other Work

The bulk of maintenance work is necessarily done during the months when weeds are growing and must be kept down. **Doing this by hand** seriously retards the other important work, costs a great deal and results are conceded to be unsatisfactory.

On many of the leading railroads, thousands of miles of track are being weeded every year by means of "HERBICIDE" without any interruption in the program of important summer work.

Let us know **how many miles** of track you have that requires weeding, the **width** of treatment and the general nature of the **vegetation** and we will gladly submit an estimate.

Important Points

"HERBICIDE" kills the ROOTS as well as the tops, so there are lasting results.

Has no harmful effect on iron, stone or wood. In fact it is a wood preservative.

Can be used to advantage on one mile or a thousand miles of track.

A Reade Spray Equipment makes possible rapid and economical application.

The **average daily** accomplishment of a Reade Spray Equipment is about 60 miles, the equivalent of **1300 man-days.**

The individual control valves on a Reade Equipment saves a great deal of chemical by spraying only where there are weeds.

A complete and experienced organization assures prompt and satisfactory service.

Reade Manufacturing Company, Jersey City, N. J.

Works: Jersey City and Chicago

No *"fingering down"*— No *accidents*

A new trip jack which can be lowered automatically, therefore *absolutely*

Safe!

"Give us a track jack which eliminates accidents in 'fingering down'!" So many railroad men told us the same thing that we decided to go into the problem in dead earnest.

Of course, combination track and automatic lowering jacks have existed for many years, but they have lacked the rugged simplicity required for track work, and therefore have never found favor among track men.

After several years of work and experiment, we developed the No. 110-A. Before offering this jack to you, it was tested for nearly one year in actual service on several railroads. The results exceeded all expectations. Railroad men pronounced it the best track jack they had ever used—**and the safest.**

The design of the No. 110-A is of the utmost simplicity—only four rugged working parts. Can be lowered automatically or tripped. The greenest track laborer in two minutes can learn all there is to be learned about its operation. It lowers notch by notch, by simple ratcheting, therefore all possibility of accidents to fingers is eliminated. It trips more easily than any 15-ton trip jack ever made—one man can do it where two were formerly required.

Write us now for free test and full particulars

THE DUFF MANUFACTURING COMPANY

Established 1883—Pittsburgh, Pa.

New York Chicago St. Louis Houston San Francisco Atlanta

No. 110

Weight 58 lbs.

Actual Lifting Capacity 15 tons.

Trips the load or lowers automatically

Revolutionary Design

Ask for **FREE** *Demonstration without obligation on your part*

Genuine Barrett

TRACK JACK no. 110

The Differential Air Dump Car—All Steel—30 Cu. Yds. Level Full

4

REASONS

WHY DIFFERENTIALS ARE BEST FOR DITCHING SERVICE

1. They protect the ballast. They discharge load well beyond ends of ties and hold it there.

2. They are easier to load. Low height makes booming-up necessary.

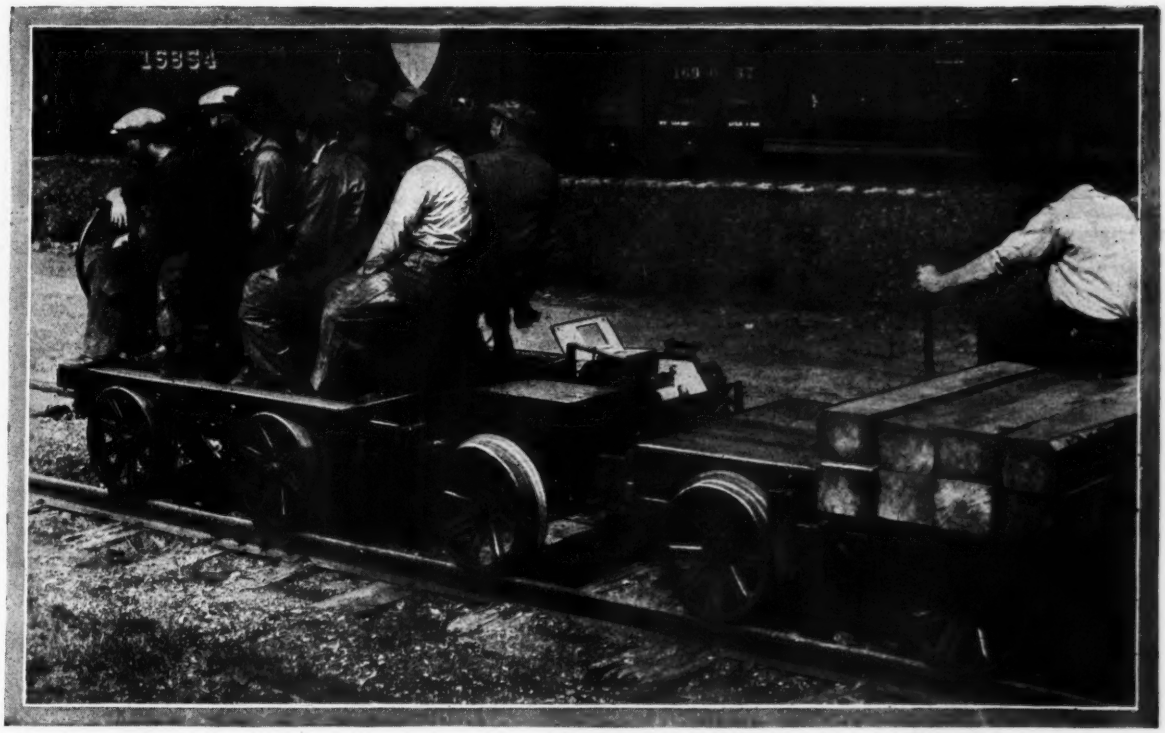
3. They tip to a 50-degree dumping angle, insuring clean dumping of very sticky material.

4. They distribute load as desired. The body, being always under control, allows the load to be placed in desired quantities at different places. Excellent for building out shoulder.

Complete description in Bulletin D-12

THE DIFFERENTIAL STEEL CAR COMPANY

FINDLAY, OHIO

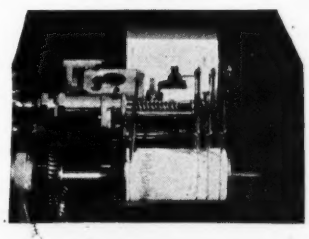


Fairmont Research in Motor Car Development Yields New Measuring Stick of Values!

Measuring Pulling Capacity by the Fairmont Dynamometer

The rated load, in men and tools, is carried on the motor car, and the dynamometer measures the surplus that the car is capable of at various speeds. Speeds are controlled by the man at the brake on trailer. Car operates at wide open throttle.

Performance on the Job Counts



The Fairmont Dynamometer

The only railway motor car dynamometer in existence. Measures

1. Maximum draw bar effort available for starting trailers.
2. Maximum draw bar pull at all speeds.
3. Maximum draw bar horse power at all speeds.
4. Economy (fuel consumption) at all loads and speeds.
5. Endurance (length of time car can sustain its maximum draw bar pull at a given speed).

For years the deciding factors in the selection of railway motor cars have been cost and performance records. These do not always take into consideration varying conditions of service. They are available only after considerable expenditure of time in observation. And the facts they offer are only *approximate*.

In view of these shortcomings Fairmont Engineers have developed a recording Dynamometer, which scientifically measures values, unbiased by personal opinion, and reveals in a *few hours* information on power economy and endurance that not even *years* of observation could disclose.

The progressive spirit which brought about this marvelous achievement has kept Fairmont constantly ahead in the motor car industry. More than half of all the cars manufactured each year are Fairmonts. 700 roads are benefiting from this leadership. Why not yours?

FAIRMONT RAILWAY MOTORS, Inc.

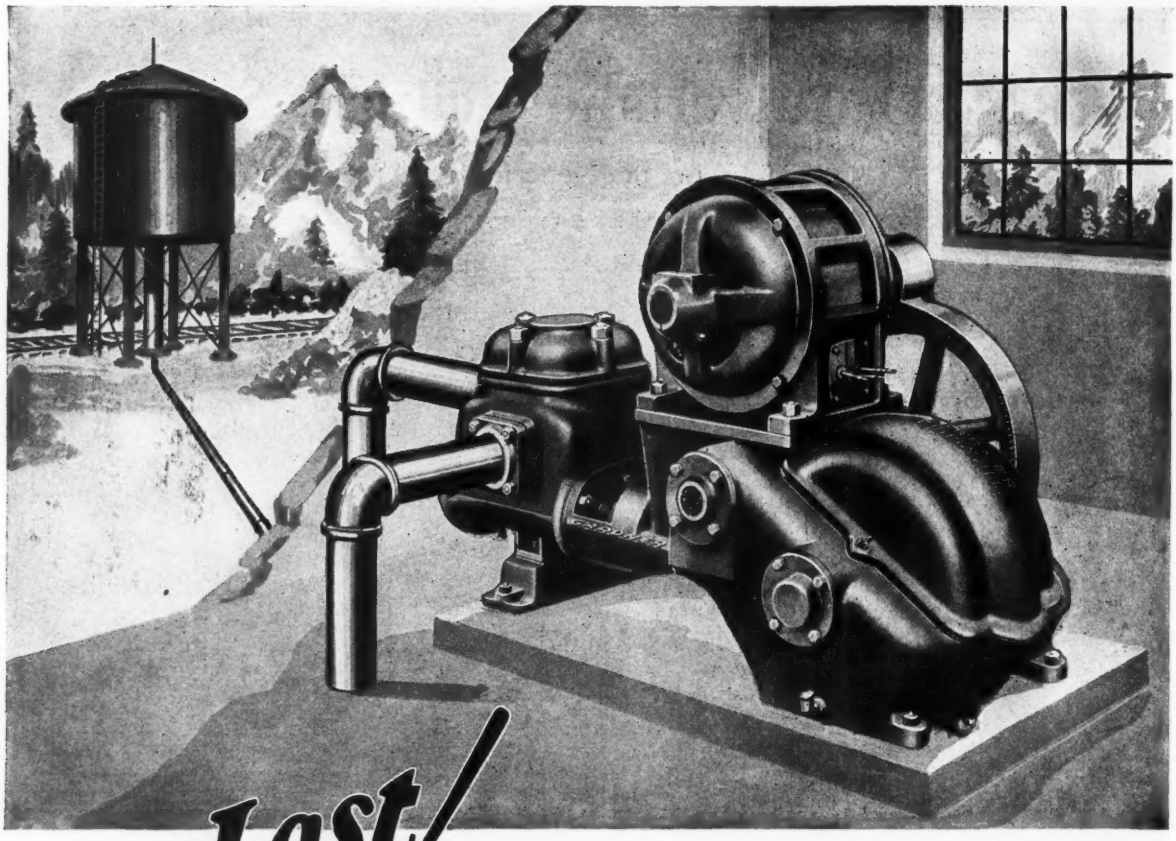
Fairmont — Minnesota

DISTRICT SALES OFFICES:

New York Chicago Washington, D.C. Winnipeg, Canada

Fairmont

Ball-Bearing Motors and Railway Motor Cars



At Last! A SELF-LUBRICATING PUMP

Forget It 29 Days—Oil It Once a Month

We consider the introduction of this, the first practical self-lubricating pump—probably the most important single event in the entire history of The Gardner Governor Company. Its reception has already indicated that it is REVOLUTIONIZING current ideas of what a power pump should be.

All parts are automatically oiled from one reservoir—like an automobile motor. The pump can be forgotten for 29 days in every 30 and controlled from any distance desired, by an electric switch. Ideal for railway water service. A time and money saver for ANY user. Ask for literature.

Territory Still Available to Agents

THE GARDNER GOVERNOR COMPANY
Quincy, Illinois

CHICAGO 549 W. Washington Blvd. | NEW YORK 534 Singer Bldg. | PHILADELPHIA 604 Arch St. | HOUSTON 718 Heights Blvd.
SAN FRANCISCO 400 Fourth St. | LOS ANGELES 419 E. Third St.

GARDNER GOVERNORS PUMPS · COMPRESSORS

GARDNER

Railway
Engineering and Maintenance

Volume 21 May, 1925 Number 5

TIMBER TREATMENT AND FOREST CONSERVATION

IN THE April issue, page 147, we presented the tie renewal figures of the Atchison, Topeka & Santa Fe for the 27 years from 1898 to 1924, inclusive, showing that in the last year this railway required only 2,046,-054 ties for renewals on 17,709 miles of track, an average of 115 per mile. If instead of 115, this road had inserted 336 ties per mile of track as it did in 1898 when the statistics were first compiled, the total number of ties required would have been 5,950,000 or 3,900,000 more than were actually used. Since it requires 12 cu. ft. of standing timber to produce one tie, this is equivalent to a saving of 46,800,000 cu. ft. of timber. Estimating the average annual growth of timber at 24 cu. ft. per acre, this would be the annual growth on 1,950,000 acres or slightly more than 3,000 square miles of forest. This is the area that would be required to grow the timber the Santa Fe would have required in 1924 over and above its actual requirements if it had not adopted the policy of consistent protection of its ties by treatment, the universal use of tie plates, etc. In view of the rapid depletion of our forests, this is a contribution to the public welfare of no small magnitude. Considered from this angle, it is difficult to understand how one can seriously question in this day and age whether a railway is warranted in going to the treatment of ties and of timber for other purposes.

TIGHT BOLTS INCREASE THE STRENGTH OF JOINTS

IT HAS come to be generally recognized that tight bolts are essential to the economical maintenance of track joints and as a result many roads have inaugurated vigorous campaigns among their track forces to eliminate loose bolts. More attention is also being directed to the design of the joints and the accessories themselves in order that they may require the minimum attention after application.

Tight bolts have recently received further recognition, however, by reason of the relationship which it has been demonstrated that they bear to the strength of the joints, contrary to the opinion which has prevailed in some quarters that there is no such relationship. In the report of the Rail Committee of the American Railway Engineering Association, presented at the convention of that organization in March, there was included a preliminary report of some tests of rail joints made at the University of Illinois during the past year in which it was shown that the deflection of the joint varies with the tension in the bolts, the deflection of the joint assembled with a bolt tension of 1,000 lb. being approximately twice as great when the bolts were drawn up to approximately 12,000 lb. The maximum stress in the angle bar was also approximately 50 per cent higher when the bolt tension was 1,000 lb. than when the tension was increased to 12,000 lb. Although these results are preliminary as yet, they go far to support the contention of those who have advocated the use of high-carbon, heat-treated bolts and devices for maintaining this tension in the bolts. In other words, the function of these devices is coming to be recognized as more logically that of maintaining the tension in the bolts than of preventing the nuts from turning.

KNOWLEDGE OR IMPRESSIONS?

ONE OF THE handicaps under which the maintenance department has long labored has been the lack of accurate data regarding the costs of its operations. There have been many opinions based on impressions, some of which are undoubtedly closely correct, while many are far from the facts. This condition has resulted primarily from the reluctance of the roads to spend any money for the investigation and compiling of information, and may be explained largely by the failure of supervisory officers to portray the importance of this work in its true light. As a result the roads have continued to waste large sums every year because of inefficient or misapplied methods and materials.

The study of the relative economy of different methods of eradicating weeds which the Santa Fe has made, as described elsewhere in this issue, is an exception to this rule. This road conducted experiments at a number of carefully selected points on its system to determine the relative efficiency and cost of the common methods of weed eradication for a period of more than five years, during which time it not only determined to its satisfaction that the use of chemicals was more economical than other methods, but it found the proper quantities of chemicals to use to secure the best results under various conditions existing on its lines. As a result of its investigation, this road is now in a position to standardize on methods for the eradication of weeds on its various territories and to accomplish this at the minimum cost. It will, without doubt, save a sufficient amount in one year to pay for any extra expense incurred in this entire study.

The problem which the Santa Fe has thus attacked is typical of countless other problems which are worthy of equal consideration, the proper solution of which will save millions of dollars for the railways. It is doubtful if there is another industry which offers as large a field for intelligent research, investigation and study as the railway field and there are few fields in which as little is being done today. While most investigations should preferably be system-wide in

scope, they need not necessarily be of this magnitude. There are few divisions or subdivisions whose officers cannot make modest studies of their own to determine the proper solution of their more pressing problems if they have the will to undertake them. Nothing will contribute a greater return in the form of reduced expenses for maintenance than a more intelligent and analytical study of the problems confronting the roads.

RAIL CANTING GETS OFFICIAL APPROVAL

A SURVEY of the attitude and practice of the railways with reference to the canting of rails, as published in the Maintenance of Way Section of the Railway Age Gazette of August 21, 1914, shows that only two roads out of 24 replying to the questionnaire were then following this practice and only three or four others looked on it with any degree of favor, while the remainder were opposed to it. A similar survey of the practice on 36 representative roads made last year and described in the September, 1924 issue of *Railway Engineering and Maintenance*, shows that 21 of these roads were then canting their rail and favored this practice, while 6 others were practicing it experimentally and only 9 were not following it.

A similar questionnaire by the American Railway Engineering Association, the results of which were incorporated in the report of the Committee on Track and presented at the convention last March, shows that 33 of the 67 roads replying to this questionnaire were canting rail as standard practice and 14 others were canting it experimentally. The report further showed that 11 roads had adopted canting as standard within the last three years.

In outlining the advantages resulting from this practice 28 roads stated that it aided in the maintenance of gage and 19 indicated that it resulted in more uniform wear of the head of the rail. The Committee on Track endorsed the conclusions of the Committee on Stresses in Track that (a) the practice of canting the rail inward reduces the lateral bending stresses in the rail on both tangent and curved track; (b) it causes a more central contact with the wheel on the rail, and (c) the most benefit is obtained from a cant of 1 in 20. As a result the Track committee presented three concise recommendations to the effect that (1) rail be canted inwardly; (2) inclined tie plates should be used to produce the desired cant, and (3) the amount of the cant should be 1 in 20.

The increasing recognition of the practical advantages resulting from the canting of rail, culminating in the official endorsement of this practice by the American Railway Engineering Association, is cause for gratification on the part of those railway men and others who have pioneered in their advocacy of this practice.

BILL AND JOHN

Bill has been foreman of Section Six for more than ten years. He is a large, broad-shouldered man who is accustomed to hard work and who spares neither himself nor his men. His section is an average section with fair ballast and rail and without any unusually adverse conditions. Yet he is always behind with his work and labors under pressure. As a result he is always short handed for his men will not continue to work long under this pressure.

John is foreman on the adjoining section. He is a short, wiry type of man, who has likewise been on his section for several years. The characteristics of his section resemble those of Bill's. The traffic is the same, yet John never seems to be rushed and his track rides far better and far more uniformly than Bill's. He is able to hold men, a condition which Bill cannot understand for they both recruit their men from the same community and pay the same wages.

What is the explanation? It is due to the fact that John plans his work in advance so that he has an objective constantly before him. When he reaches his tool house in the morning he knows what he is going to do that day. He makes every step count and there is no unproductive expenditure of labor on his part. Bill, on the other hand, starts out in the morning without a definite plan. He goes from one rough spot to another, always just one step ahead of trouble and never having time to do his work well.

There are Johns and Bills on every division, but it is to be hoped that the Johns will increase in number as the Bills watch their methods and learn the value of systematic conduct of work, for they will in this way be able to maintain their tracks to a higher standard—and with less effort.

LOOKING AFTER THE LARGE BRIDGES

THE BRIDGE supervisor is primarily responsible for the inspection of bridges. As far as timber trestles and the smaller structures are concerned, the responsibility rests almost entirely on him. In the case of the larger bridges, especially important steel structures, he shares responsibility with some system officer, usually a bridge inspector but in some cases the bridge engineer himself, but in the periods between the system officer's inspections, the duty falls almost entirely on the division bridge officer.

The defects to be found in large steel bridges are of an entirely different nature from those occurring in wooden trestles and culverts. But entirely aside from the nature of the material, that common menace to all structures, foundation settlement, must be looked for in an entirely different way in the large steel bridges than in the smaller structures. The settlement in a tall pier may occur in such a way as to show no effect in the alinement in the track. If the spans supported by the pier are long considerable settlement may take place without making itself apparent in the track surface while an unequal settlement in the direction of the bridge may easily become serious long before the pier will have the appearance of leaning. Such conditions must be detected in other ways, for example, by noting that the space between the ends of spans on the pier is closing or opening through the adjustment taking place in the expansion bearings.

It is true that these or other defective conditions will not escape the keen eyes of the system inspector, but such action is progressive and will often approach serious proportions in the interval between his visits even though he makes it a point to see the structure more often than his regular schedule calls for. However, owing to his more convenient access to the structure, it is the division supervisor upon whom the responsibility for the systematic watching of the bridge is definitely imposed.

Intelligent observation of these characteristic defects in a large structure calls for more than a faculty for close observation. It is by no means a matter of "looking for cracks" but a careful checking of critical

parts of the structure under various conditions of load, fortified with a thorough knowledge of how a span acts under load and under changes of temperature. It is a matter of knowing where to look and what to look for. Defects such as the one cited are progressive in their action. There are many cases where the trouble continues for years and must be constantly watched. While these cases present serious problems, once disclosed the duty becomes primarily that of watchfulness to insure that the condition does not become dangerous before steps can be taken to provide at least a temporary expedient to prevent an accident. The real problem of the supervisor is to be alert in the detection of new defects not previously noted, and to fulfill this responsibility he must be possessed of a thorough knowledge of his subject. This does not mean that he must have had technical training in bridge engineering but that he has acquired through long experience that "bridge sense" which has made many an old bridge supervisor an exceedingly valuable member of the bridge engineer's organization, entirely aside from the part which he plays in the supervision of actual work.

THE PROBLEMS OF WATER SERVICE

AN ARTICLE appearing on another page tells how the Chesapeake & Ohio developed its water service facilities at a large engine terminal in Kentucky and outlines the various steps taken in replacing some rather crude semi-portable steam facilities with a modern electric plant of much larger capacity. The impression which a reading of this article is sure to leave is that of the involved technique of railway water service. One point touched but briefly concerns the water-treating facilities and the problems incident thereto. More stress is placed on the difficulties entailed in securing water from a stream which frequently carries enormous quantities of silt and other suspended matter. Even more involved were the questions of pumping machinery, including problems of hydraulic, electrical and mechanical engineering.

It goes without saying that the development of the water service plant at Russell, Ky., is not the work of one man. A project of such magnitude represents the combined efforts of several members of the railroad organization. It is almost equally certain that representatives of more than one manufacturer gave valuable suggestions that were of definite help in solving the perplexing problems imposed. However, it should be equally clear that the problems of water service are so intricate that no one can expect to become thoroughly versed in them unless he specializes in this subject alone. This means concentrated study of the engineering principles involved and a daily contact with the work which results in the accumulation of the experience necessary for the development of sound judgment. Water service has become too important a subject to be handled as a side line by the division or system officer who is held responsible for many other classes of engineering work.

HARD TIES AND SOFT TIES

THERE ARE still railway officers who insist that there is no tie like a white oak tie and that white oak resists decay so well that there is no occasion to incur the expense of treating it. The merits of white oak as a tie timber are generally recognized, particularly its strength in compression across the grain which makes it so resistant to crushing or cutting under the rails. But an untreated white oak tie under average service conditions will decay long before it is destroyed mechanically and will not last as long as a much softer tie that has been treated to prevent decay and is properly protected against crushing by the use of tie plates of adequate size and strength.

This has long been recognized and explains why the railroads have not hesitated, with the growing scarcity of the harder woods, to make extensive use of the less expensive wood in their tie renewals. Moreover, it is well known that the railroads which have made the most pronounced reductions in their average annual tie requirements per mile of track have for years included in their tie purchases enormous quantities of pine and other soft wood ties. It would seem, therefore, that the problem of railway tie requirements today is not that of trying to obtain the greatest proportion of the limited amount of hard wood ties available but to purchase ties of any wood recognized as suitable for this purpose and insisting on the definite fulfillment of certain requirements. Most important among these are that the ties shall comply strictly with specifications as to soundness and size, that they shall be properly treated, adequately protected against wear and crushing in service, and that they shall receive intelligent care while in the track. It is in more careful attention to these details that greater economy in the use of railway cross ties is to be expected.

THE HIGHWAY CROSSING DEMANDS CONSTANT ATTENTION

NOT THE LEAST important of the changed conditions imposed on the railways by the rapid increase in the use of the automobile has been the necessity for the devoting of more attention to the maintenance of highway crossings. The mileage of improved highways is increasing rapidly throughout the country. The traffic on the highways is increasing even more rapidly.

The automobile with its higher speeds and with hard roads on each side of the crossing is demanding a higher standard of construction and of maintenance on the crossing itself than was necessary with the slow-moving horse-drawn vehicles on the dirt roads of a few years ago. The automobile is also more severe in its action on these crossings, causing the earlier forms of construction to give way rapidly. These conditions have given rise to a marked increase in the cost of crossing maintenance which in turn has led to the development of other forms of construction which offer improved riding qualities with greater durability.

This is the season when the automobiles come on the highways in the largest numbers. It is important, therefore, that the crossings be brought to the proper standards of maintenance promptly and that each foreman and supervisor see that the crossings under his jurisdiction are maintained in this condition throughout the entire season. The cost of maintaining a crossing properly is not much greater than that of maintaining one merely in passable condition and this cost is repaid many times over in the good will which it creates on the part of the highway user.

LESS FREIGHT STOLEN. The Protective section of the American Railway Association has reported that in 1924 the losses of the railroads through robberies were nearly 29 per cent less than in 1923, while the ratio of robbery charges to the total payments for loss and damage of freight decreased from 6.3 per cent to 4.8 per cent.

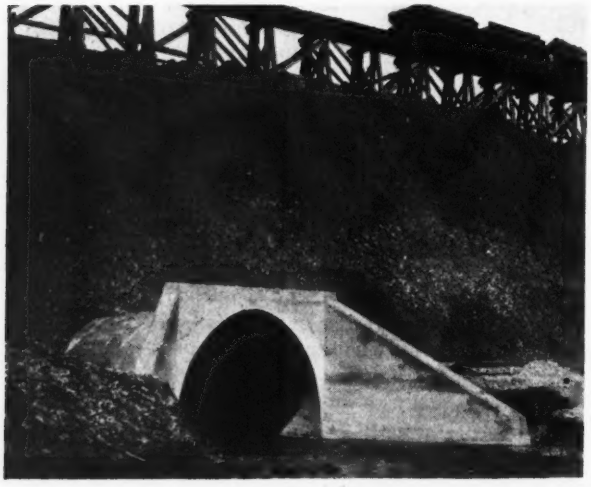
The Longest Structure Filled Was at Comal, Ark., with a Length of 1,862 ft. and a Maximum Height of 58 ft. It Was Filled Complete with the Exception of a 112-ft. Steel Trestle

Missouri Pacific Replaces 47 Bridges With Embankments

Total of 3,400,000 Cu. Yd. of Filling Used to Eliminate 3.8 Miles of Timber Trestle on the White River Division

THE MISSOURI Pacific has virtually completed a program whereby 47 timber bridges, containing nearly 9,000,000 ft. b. m. of timber, have been eliminated on a 96-mile stretch of its White River division through the Ozark mountain region of Missouri and Arkansas. The 47 bridges, which had a combined length of 3.8 miles, and a height, for the highest, of 122 ft., have all been replaced by earth embankments, the grading and removal of the old decks having been accomplished without serious interference with traffic.

It was the inevitable approach of the end of the service life of the timber structures that led some time ago to the decision to do away with the bridges wherever practicable. The construction of the White River division, the 269-mile connecting link between the Joplin division at Carthage, Mo., and the main line to the southwest of Diaz, Ark., was begun in 1901 and the last section completed in 1906. The division provides a short route, through the picturesquely beautiful Ozarks, from the northwesterly to the southeasterly lines of the system.



The Largest Culvert Was a Five-Centered Arch Structure Containing 1,253 cu. yd. of Concrete

Naturally, construction of such a line over a rough, mountainous cross drainage country, traversed by swift, twisting streams that sometimes become torrents, presented many difficulties. This was especially true between Crane, Mo., and Cotter, Ark., a track distance of 96 miles, in which the White River is crossed twice, the James once, and smaller streams several times.

A satisfactory grade line of one per cent, with moderate curvature, was finally secured between Crane and Cotter, after the problems presented by the necessity for heavy construction, deep rock cuts with correspondingly deep fills, five tunnels of a total length of two miles between the principal watersheds and nearly 60 bridges had been coped with successfully for the time being.

These bridges, some containing more than half a million feet of lumber, the longest being nearly 1,900 ft. in length, the highest 122 ft. from track to ground, were erected across the deeper ravines in cases wherein time and material were not available for earth fills. The timber was of the best grade procurable; but as the end of its useful life approached with the passage of 20 years and repairs became increasingly necessary, it became evident that the bridges would either have to be rebuilt in kind, at a considerably higher price for timber, or else be replaced by steel viaducts or by filling.

Accordingly a construction and improvement program for the timber bridges between Crane and Cotter was outlined in 1915. It called for the rebuilding of some bridges and the filling of others, steel viaducts

being dropped from consideration when estimates showed them to equal the cost of filling. Work was begun in the latter part of that year. The success of the filling method became more and more apparent as the work went on and bridges at first deemed better rebuilt, because of the filling difficulties presented, were added to the list of those to be replaced by earth embankments.

Only Ten Bridges Rebuilt

The final program, now lacking only a few weeks of completion, will show only 10 bridges rebuilt to 47 filled. The longest trestle completely filled was 998 ft. in length, with a height of 75 ft. The highest was the 122-ft. trestle already mentioned, its length being 702 ft.

Prior to the work of filling, which was carried out by contractors who provided steam shovels, locomotives and dump cars, railroad bridge gangs went over each trestle, tightening up and repairing the post splices and bracing. Afterwards it was necessary to keep a bridge gang continuously on hand or within easy reach to replace bracing stripped from the sides of bridges by descending rock, unavoidably loaded in the dump cars, or by huge chunks of dirt consolidated into compact masses during wet or freezing weather.

To provide for drainage through the embankments, box culverts of reinforced concrete were built in advance of the filling operations. In some cases water channels had to be changed or diverted to join with others traversing the culverts. Twelve thousand cubic yards of concrete, reinforced by 500 tons of steel bars, were used in the culverts, the longest of which had a barrel of 378 ft.

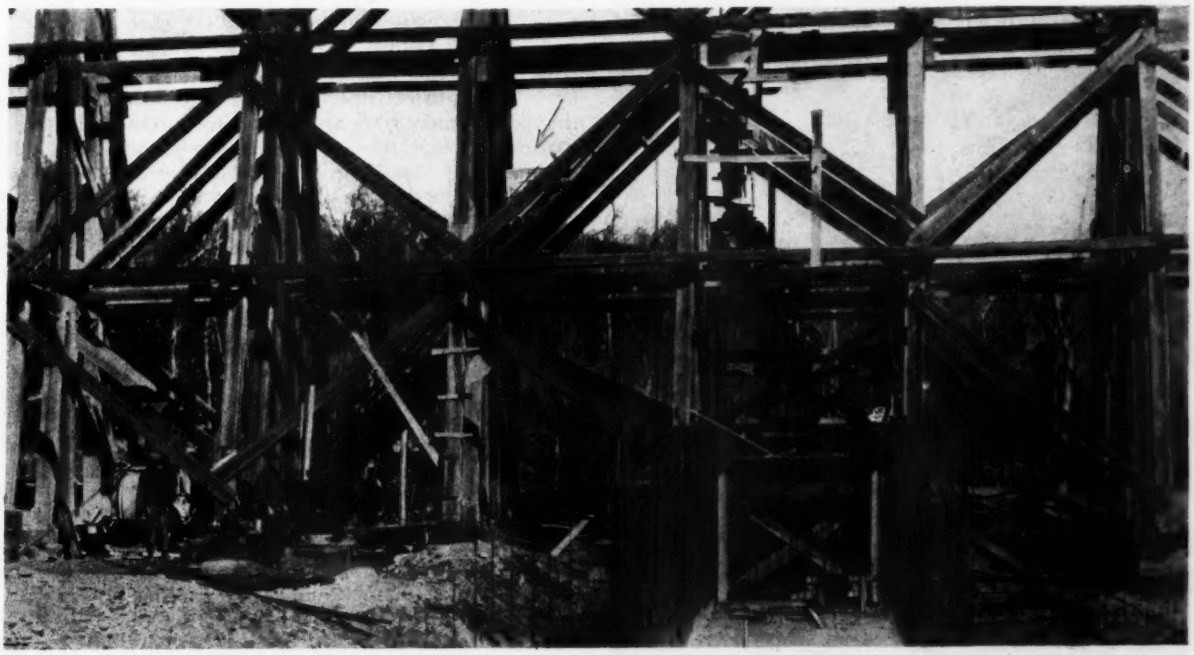
Heavy Grading Program Involved

For the work of filling, 3,400,000 cu. yd. of earth was dug from the hills, hauled in trains of dump cars for distances of 1 to 11 miles, and spilled into place. Two main line road crews were used (with a helper engine in the pit) operating three trains, each comprising 12 side dump cars of 12 cu. yd. capacity. The trains frequently had to be spotted several times, with each car chained to the track to prevent tipping over. Air dumping, for which the cars were equipped, was found unsuited for this work of filling high bridges.

This Box Culvert Was Covered with an Earth Cushion by Team Work Before Dumping from the Trestle

The weight of the locomotives used ranged from 45 to 65 tons. Each contractor carried about 40 dump cars, and an extra shovel was generally held in reserve. An air-operated spreader was also employed. Approximately one-third of the material for each bridge had to be spread, the operation necessitating an extra engine and train crew while the spreading was in progress.

The top of each fill was finished rail high and spreader wide (about 40 ft.) but except in the lower fills and depending somewhat upon the condition of the mate-



The Concrete for the 10-ft. by 10-ft. Concrete Box Culvert at Bridge 122 Was Placed by Elevating it in a Concrete Car on an Inclined Track and Then Depositing it by Means of Chutes

Dumping Material from One of the Trestles

rial, the slopes seldom reached the slope stakes for a 20-ft. roadbed. The settlement varies greatly with the condition of the material at the time of filling. The shoulders round off, the main settlement is at right angles to the line of slope, and is about 8 to 10 per cent of the center height of fill during the first year.

The "topping out" process followed, the shoulders and slopes being filled out wherever necessary. In the higher bridges the topping out was repeated, making three fillings in all. After this second or third filling had had a reasonable length of time to settle, the stringers were removed and the track placed on the ground and ballasted, although a minor settlement will occur until the fill is four to six years old. During this period, however, the maintenance cost has rapidly decreased, and, at its conclusion, a consolidated earth embankment with all its advantages, will be secured.

Steam Shovels in the Pit at Crickett, Ark.

Training Young Men for Section Foremen*

By G. T. Anderson
General Roadmaster, Kansas City Southern, Texarkana, Tex.

MY IDEA of the best method of training men for positions as foreman is to select promising young men with a common school education, or better, who will enter our service as track laborers with the understanding that if they prove themselves worthy and capable of promotion to the position of section foreman we will endeavor to promote them as vacancies occur, or place them on an extra gang as assistant foreman in readiness for such vacancies.

I have heard it said many times that a young man with a common or high school education will not enter track work as a laborer and that is usually the case, but if we were to canvass the line we would probably find some in our service at this time. There are other young men who have been forced to leave school on account of financial conditions or for other reasons, and who with a promise of steady work or possibly because no other work near their homes pays as much as track work, would probably enter our service if some encouragement were given them. Some of these men would remain with us, while others will become discouraged and quit. However, with proper encouragement I believe most of them would remain.

I have promoted several young men to foremen, and have taken much interest in assisting them and getting them started in their work. It is quite easy for a new foreman, especially a young man to become discouraged if a roadmaster criticizes his work too harshly, or instructs him to perform work which he has had no opportunity to handle or become familiar with before his promotion. The roadmaster should be careful to go over such work with a young foreman in order that he may not become discouraged. A new foreman needs the advice and counsel of his roadmaster often, as he will be called upon to handle many different kinds of work and should have proper guidance in the best methods of handling them.

A roadmaster is usually more or less acquainted with all of the laborers who remain on his district for any length of time, and as a rule is familiar with the young men who are trying for promotion. The roadmaster and the foreman under whom such men are working should give them advice and ideas on track work, and teach them to do it properly, and to take advantage of their work wherever possible. Such men should be given an opportunity to raise and line track, and be instructed regarding the planning of their work, and the handling of emergencies.

It is very necessary to have at least three or four young men in training on each roadmaster's district, and they should be given all the advice and encouragement possible from time to time, not only on how to handle their work but their men as well. They should be given work as relief foremen as occasions require on their respective districts, if they are capable.

After a man has worked a year or longer as a section laborer, depending upon the man, and has received training in lining and surfacing, raising track, and general track work, he should be placed with an extra gang, either as a laborer or as an assistant foreman, where he will get experience in laying rail, ballasting and switch work. After he has served from four to

*Abstracted from a paper presented before the Kansas City Couthern Maintenance of Way Association.

six months on an extra gang he is usually qualified to handle a section. This training on an extra gang is of much value to a young foreman after he has been promoted, as in the extra gang he acquires knowledge and experience in the handling of heavier work, and also gains confidence which he would not be likely to get on a section. Then too, a man with this training after experience as a section foreman is capable of handling an extra gang.

A man who has been placed over other men in a gang should have sufficient will power to control his men and maintain authority without being abusive or profane. The bull-dozing of men is an objectionable practice, and it is not the way to handle them successfully. Instruct a man and gain his confidence. A foreman who can get good men, and keep them and get more like them when needed, is of much more value to a railroad than one who is frequently discharging his men, and who seldom has help when it is needed. A man in charge of a gang or even a laborer, should try to gain the confidence of his foreman and fellow workers. When this end is accomplished he has faithful workers. To do this is not necessary for the foreman to become too familiar with his men. If he has a man working for him who will not do the work as he is told, that man's services should be immediately dispensed with, and another man hired who will do the work as instructed.

A man should not work with the idea that he has learned all there is to know about track work. If a man under your supervision should suggest something that you know will be an improvement, do not hesitate or be ashamed to adopt it. My experience as a foreman and later as a roadmaster has been that constant association with men along the line, both foremen and laborers, will bring out ideas which are sometimes of great value.

If any young man selected with a view of promotion to a position as foreman, fails to show a reasonable degree of intelligence and aptitude for the work after he has been in the service four or five months he should not be retained with the idea of promoting him. It should be the desire of the roadmaster to place only such men in these positions who will eventually prepare themselves and work for further advancement.

When an ambitious young man enters the service with the thought of gaining promotion he will sometimes think that advancement comes very slowly. So the foremen who are training them should give them as much encouragement as possible and not allow them to feel that there is no longer a chance for them.

A man's work is material with which to build character and manhood, and is life's school for practical training of the mind and development of intellect, and not merely a mill for grinding out a salary of dollars and cents. A man's work is his opportunity to observe and profit by the training and success of his superiors, and learn from their mistakes while receiving pay, and best of all, increase his knowledge for development.

Creosoted Timber Trestle Withstands Severe Fire

By Carter L. Wilson

Assistant Engineer Bridges, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

On THE afternoon of November 1, 1924, a fire occurred at Trestle 181.6 over Loosa Hatchie creek on the Memphis and Paducah division of the Nashville, Chattanooga & St. Louis when a 10-span, creosoted timber, ballast deck trestle withstood the intense heat of burning creosote oil, fanned by a stiff wind paralleling the structure, for a period of one hour. The fire, starting at the end bulkhead, spread rapidly until the entire structure was enveloped in flames. The dense smoke which this caused, attracted the attention of section gangs working two or three miles on either side of the structure, but the heat was so intense that it was impossible for them to approach close enough to throw on water until the fire had, in large part, died out.

Before the ballast deck was placed in 1918 the structure had an open deck on red cedar piles. The ballast deck was put on these piles as they were found to be still good for a few years' longer service. In 1923 the trestle was redriven with creosoted piles and now conforms to the company's standard plan for an all-creosoted timber pile structure with the exception of four red cedar pile bents on the south end which were practically new when this redriving was done.

The alinement is northeast and southwest at this point. The trestle carries the track across a flat draw having a maximum depth of 14 ft. and traversed by a small stream.

As nearly as can be ascertained from the condition of the burned timber the fire is believed to have started at the top of the south bulkhead on the east side of the track. It is believed that coals dropping from a passing engine set fire to uncut dry grass on the right-of-way which was communicated by sparks to an accumulation of dry grass and leaves deposited by the wind against the bulkhead. The fact that the last two bents on the south end, Bents 20 and 21, were

Where the Fire Started. The Bolts in the Decking Were Originally 2½ in. From the Ends of the Planks

not damaged, that Bent 19 was only slightly damaged and that Bent 18 was completely destroyed and required renewal (all being of red cedar) further substantiates the theory that the fire originated in the bulkhead timbers. Evidence shows also that the fire was kept above the caps for at least two bents and until the protection of the high riprap wall could no

A View of the Trestle After the Fire From the End at Which the Fire Started

longer keep the wind from whirling the flames into the bents further on. The small fire, once started and intensified by the action of the wind, generated enough heat to draw the creosote oil out of the bulkhead timber which in turn ignited readily and gave rise to flames which, under the influence of the wind, spread successively from one span to another.

Fire Loss Severe Near Center of Bridge

For some unaccountable reason the stringers and caps in the center third of the trestle were not burned as badly as those in the end thirds. After scraping the charred stringers to unburned wood they were found to measure 7 in. by 15 in. in the center third,

View Showing the Condition of the Stringers After the Fire

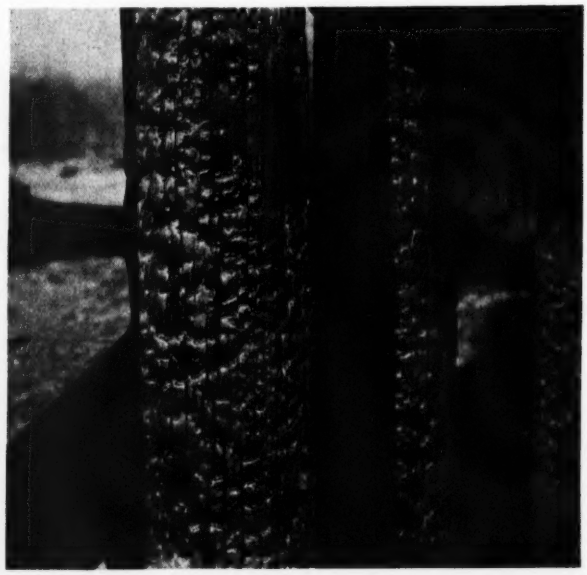
6 in. by 14 in. in the south third and 5½ in. by 14½ in. in the north third. Three short stringers and six caps were replaced, together with two piles in Bent 19, six piles in Bent 18 and all the bracing before traffic was reopened under a slow order. The cost of the labor and material for these renewals was $714.

The only parts of the structure which were not set on fire were the faces of the different members in contact, such as the bearing of the decking upon the stringers, the stringers upon the caps and the caps upon the pile heads. The south faces of the piles were not burned as deeply as the north faces, due to the direction of the wind which kept the fire always to the south. The inside faces of the stringers, which are separated only an inch, also escaped the severe burning owing to the partial absence of draft in the pocket formed by adjacent stringers and the overhead decking. The top surface of the decking, of course, was not affected by the fire inasmuch as it was covered with ballast, although the flames whipped over the ballast curbs and slightly charred the ends of the creosoted ties. The piles, other than those requiring renewal as noted above, were charred to a maximum depth of 1½ in.

A close examination of the charcoal on the timbers and piles leads to the conclusion that the fire smothered itself, for as the creosote oil burned it left a residue imbedded in the charcoal which excluded the oxygen necessary for the continued combustion of the unburned wood.

Sufficient Creosote Still in the Timbers

An examination of the unburned portion of the timbers and piles showed that a sufficient quantity of



Condition of a Typical Creosoted Pile Bent. The Sway Bracing is New

creosote oil still remains in the wood to preserve it from decay. These were steam seasoned and treated with 16 lb. of No. 1 oil, complying with American Railway Engineering Association specifications.

The strength of the stringers had been so impaired through the reduction in section caused by the fire that they were overstressed about 50 per cent under the heaviest engines operated at unrestricted speed. In the face of this overstress it was thought best to add a fourth stringer to each chord. Because of the use of what is termed a line brace casting attached to the stringers in conjunction with a rod bolted to one of the piles under each chord this change can be readily made, as it dispenses entirely with drift bolts from the stringers to caps.

The Sprinkling Train with Which the Santa Fe Does Its Weed Killing Work

Santa Fe Makes Exhaustive Study of Chemical Weed Killing

Experience With This Practice Since 1912 Justifies Treating of 500 Miles of Track This Season

WEEDS HAVE always constituted one of the most annoying problems with which the maintenance of way department has had to contend. They have never been respecters of track, but from the beginning have persisted in springing up wherever a foothold has been offered, causing unsightly track, creating a fire hazard, obstructing drainage, fouling and dislodging ballast, promoting decay of ties and otherwise interfering with the proper and economical upkeep of tracks. As a result, each year the railroads have been confronted with the problem of their removal. The common method, and until recently the only method, of accomplishing this was by hand weeding. The weeds and grass were permitted to flourish until it became necessary to cut them down with the scythe, hoe or shovel. With the growing realization of the importance of keeping down weeds and the corresponding appreciation of the magnitude of the weeding problem, particularly in those sections where weeds are prolific, there has arisen an insistent demand for better and cheaper methods of doing this work. The effect has been the introduction of various substitutes for hand weeding, prominent among which is the process of weed destruction by chemicals. Probably no road has given more consideration to the problem or has studied it more carefully than the Atchison, Topeka & Santa Fe, which has been spending in the neighborhood of $50,000 annually for this treatment alone.

Weed Killing Big Problem on Santa Fe

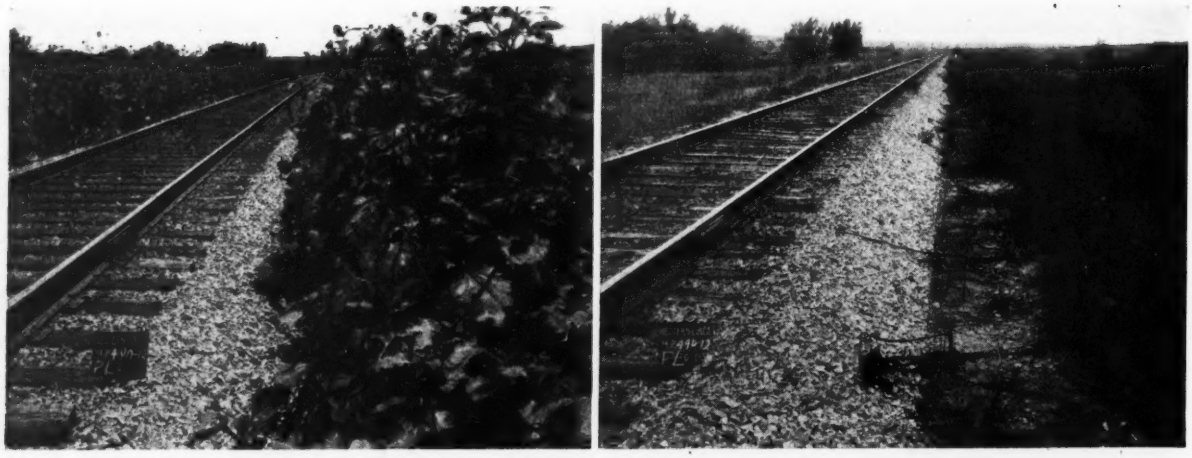
The Santa Fe has been confronted with a serious problem in keeping down weeds. Much of its 12,000 miles of lines traverse fertile agricultural sections in the central and south west, where the long warm seasons foster a luxuriant growth of a wide variety of grasses and other forms of vegetation. In many places a single cleaning is not sufficient to hold the vegetation in check throughout the season and the weeds must be cut twice or three times and in some sections even four and five times. To neglect the work one season is only to encounter increased trouble the following season, while in the meantime the condition of the ballast is noticeably affected. This is particularly the case with the rock ballast used on the main lines, which must be consistently well maintained to carry the increasingly heavy tonnage.

Chemicals Were First Used in 1912

Chemicals were first used for killing weeds on the Santa Fe in 1912 when about 30 miles of track on the eastern portion of the system were treated with a solution prepared in the company's laboratory. For several years following, the mileage was increased annually, and several experiments were made with other solutions, prominent among which was a solution known as "Dinamine" which gave excellent results. During the war, chemical treatment was omitted altogether, but in 1919 it was resumed with a weed killer known as Atlas A. In 1920 this treatment, which was applied in the proportion of 20 parts of water to 1 part of chemical, was considerably extended.

The experience of these early years of treatment did not demonstrate definitely that chemical treatment was the solution of the weed killing problem. Encouraging reports from some points were counteracted by equally discouraging reports from other locations. However, some excellent results had been obtained. It was recognized, moreover, that the work had been more or less disorganized from a system standpoint. It was felt that the situation warranted closer study and a committee was appointed to investigate the whole question of weed killing and make suitable recommendations.

After a careful investigation, this committee found that the chemical treatment in preceding years had been reasonably effective. While failing to sterilize



The Weed Killer Left No Doubt of Its Effectiveness on Sunflower Growth

the ground completely against future growth of weeds, it was found that the treatment had resulted in a noticeable decrease in the amount of vegetation in the year following application and it was concluded that a heavier application would probably produce better results. The irregularity of the results was partly explained by the fact that some varieties of grass were more resistant to treatment than others. This resulted in the segregation of the vegetation into two classes, with the Bermuda, Johnson, Salt and Wire grasses in the first class, which required an extra heavy treatment, and all other grasses of the perennial variety, including those growing from grain which fell from the cars, in a second class which required lighter treatment.

Preliminary studies to determine the economy on sections chemically treated as compared with sections where the weeding was done by hand, did not reveal any conclusive reductions in track labor costs but it was considered reasonable that a better condition of track resulted from the reduced demand upon labor for weeding which allowed the time to be spent on more important work in connection with the upkeep of track.

Over 2,000 Miles Treated in 1921

The result of the committee's investigation was the recommendation that some 2,100 miles of track be chemically treated by contract during 1921. This mileage was divided into three classes: Class A track comprising that not previously treated, Class B comprising that treated only in 1920, and Class C track that which was treated in both 1919 and 1920. The program included 25 miles of track on the Gulf lines which were to be given an extra heavy treatment to determine the effect on Bermuda and Johnson grasses. Specifications were drawn to cover the amount of chemical to be applied on the various classes of track and the different widths of treatment and suitable arrangements were made to take photographs to show the conditions before and after the treatment. It was also provided that the general manager's representative on the committee should accompany the weed killing train while on his territory and that a chemist should also be present to test the quality and strength of the solution applied.

Economy of Chemical Treatment on Dirt Track

On the whole, the 1921 application over the system was considered satisfactory with a few exceptions attributed to adverse weather conditions. There was some question, however, as to the economy of the chemical treatment on dirt track in view of the necessity of working over practically all of this class of track every season owing to the heavy power and equipment which it has become necessary to operate upon it. While the results obtained in killing the vegetation on such track were no less effective than elsewhere, this working over each season destroyed the sterilizing effect of the chemical beyond the year of application. In planning the next season's work, therefore, all dirt track was eliminated except one or two experimental sections, which reduced the 1922 program to less than 1,000 miles.

A Stretch of Track with Johnson Grass Before and After Treatment

During the spring of 1922 a company sprinkling train was equipped for applying chemicals for experimental purposes and several sections on which the more resistant grasses flourished were set aside for experiments with extra heavy applications ranging up to 300 gal. of standard arsenic solution per mile. These experimental treatments, while eradicating some of

A Close Up of the Weed Sprinkler

the grasses, were somewhat disappointing in that they did not absolutely kill the Bermuda grass and in killing off the Johnson grass, left the Bermuda grass to flourish without opposition.

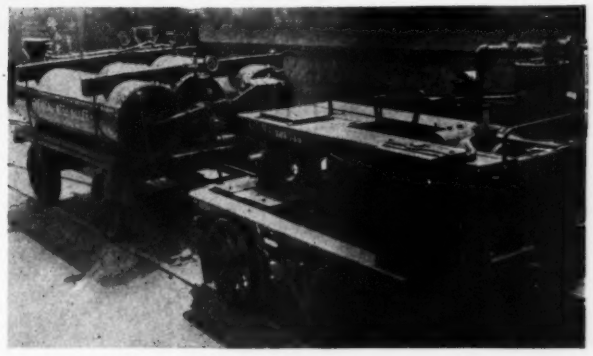
The work done in 1923 was confined to the Western Coast and Gulf lines, owing to the fact that a large portion of the rock ballasted track on the Eastern lines that had been chemically treated previously was to be re-worked that season, making it inadvisable to treat it, with the result that less than 500 miles of track were treated. All chemicals were applied with the company's own sprinkling train. This consisted of a sprinkling car and five tank cars, the sprinkling car affording living quarters for the operators. All sprinkling is done under air pressure from the train line through perforated pipes under the forward end of the sprinkling car, the arrangement of pipes and central valves being such as to provide flexibility in the distribution of the chemicals.

1923 Work Proves a Labor Saver

It was noticed in the spring following the 1923 application that the more resistant grasses, if not killed, had been held in check and it was the general belief from observations that successive heavy treatments will eventually drive back the Johnson, Bermuda and Salt grasses to a distance from the track where their presence will cause little or no trouble.

Reports received from the roadmasters and other officers were uniformly good. Cognizance was also taken of the fact that prior to the use of chemicals the time of the track forces from July until October was taken up almost entirely in the pulling or cutting of weeds, while with the use of chemicals these forces had been free to perform ordinary track work. Figures compiled indicated that the chemical solution, to a certain extent, was sterilizing the ground, as reflected by the low cost of hand cleaning in the year following that when the sections had been given a heavy application of chemicals, thus showing that the results of the treatment extend over two or more years.

Supplementing the standard equipment, there was constructed in 1923 a small portable sprinkling car which consisted of three tanks mounted on push cars



The Spot Sprinkler Ready for Use

and pulled by a motor car, the latter being equipped with a small air compressor. This outfit was supplied with chemicals from a tank car which was hauled from station to station and set out by local freight. Ample hose is provided to enable two men to sprinkle scattered patches of weeds both on territory on which it would not be profitable to run the sprinkling train and for follow-up work on territory covered by the main sprinkling train, catching all patches which show new life. A solution of four to one is used with the small sprinkling equipment in order to cut down the quantity carried.

The application of chemicals during the 1924 season was again made by the company sprinkling train under

Morning Glories and Other Vines Prove Resistant but Not Immune to Treatment

the direction of the chief chemist and the committee's representative for the territory treated, and such arrangments proved highly satisfactory as the gallons applied and the mile post locations were worked out more or less completely at the time of application. By treating to the full width of 20 ft. the more obnoxious cleaning cost approximates $100 per mile, which indicates that there is economy in the use of chemicals, even in first cost.

From a tabulation of all available data compiled during the last 10 years, the Santa Fe Weed committee believes that the application of chemicals is a paying

Total Cost of Applying Chemicals

Lines	Miles Treated	Cost of Chemical Including Freight	Work Train	Extra Labor	Water	Grand Total	Average Cost Per Mile	Aver. No. of Gal. Applied
Western								
Retreatment	34.2	$ 2,182.78	$ 126.55	$ 20.61	$ 4.62	$ 2,334.56	$68.26	Varying
Treatment	157.2	13,244.84	475.29	71.03	42.29	14,083.45	89.59	Varying
Coast								
Los Angeles	25.5	1,692.99	136.26	38.56	8.67	1,876.48	73.58	170
Valley	56.4	4,653.63	403.96	74.35	25.93	5,157.87	91.45	206
Gulf								
Southern	93.7	7,665.43	332.33	246.22	15.11	8,323.09	87.86	145
Northern	91.8	6,716.38	322.03	311.87	13.22	7,611.50	82.91	131
Total	458.8	$36,156.05	$1,796.42	$762.64	$109.84	$39,386.95	$85.85	.....

Chemical Costs—$0.56½ per gallon, Spring delivery, $0.40 per gallon, Fall delivery.

grasses have been, to a certain extent, held in check, while the annual varieties have been destroyed.

Thus far, satisfactory results have not been obtained in eradicating the Bermuda grass, but it is believed that Johnson grass can be killed by the application of chemicals in heavy quantities and the committee is of the opinion that track infested with the hardy variety of root grasses should have a heavy dose on the first application, followed by light annual treatments thereafter.

A Graphic Picture of Weed Killing

Results Taken in May, 1924, at the Dividing Line Between Two Divisions. The Track in the Background Got Three Hand Cleanings in 1923. That in the foreground Received One Application of Chemical in 1923.

The itemized costs of applying chemicals with company apparatus during the 1924 season is given in the accompanying table which shows the 458 miles of track treated cost an average of $85.85 per mile.

A tabulation of the information submitted by the general managers covering the cost of cleaning track by hand on rock and gravel ballast on sections set aside for special record shows that while there is a considerable variation, depending on the kind of ballast and the geographical location, the average hand investment, especially so with the more favorable price of the arsenic solution of late. In view of this conclusion, it is planned to treat over 500 miles of track with chemicals during 1925.

Southern Pine Association Adopts Grade Marking

ALL MILLS which are members of the Southern Pine Association are now authorized to mark each piece of lumber manufactured with a mark indicating its grade. This was adopted by the association as a regularly authorized practice at its tenth annual meeting at New Orleans, La., on March 24 and 25. It became effective on April 1, 1925.

The nature of the marking is shown in the illustration. The number within the circle identifies the mill

The Official Grade Mark

producing the lumber, the letters "S P A" comprise the official symbol of the association and the letters "B & BTR" for B and Better, indicate a typical grade. The stamp and dies and mill numbers for grade marking and trade marking under the Southern Pine Association's guarantee must be secured from the association, and only subscriber mills can be authorized to use this "S P A" brand, for the reason that only subscriber mills receive the association's official inspection service, by which the integrity of the association's standard grades for southern yellow pine is maintained.

Grade marking under the Southern Pine Association's plan means protection to the manufacturer, because his identity stays with that lumber through to the ultimate consumer and his certified product is backed up by the guarantee of the association's inspection service and grades. The association's grade marking plan conforms to the recommendations adopted by the National Standardization Conference on this subject and has been endorsed by practically all of the larger organizations of lumber users.

Setting in a Rail with the Machine

Sixty Men Relay Nine Track Miles of Rail in Four Days

Thorough Organization With Ample Supervision Makes This Commendable Record Possible

By P. Petri
Division Engineer, Baltimore & Ohio, Cumberland, Md.

THE PROGRAM of rail renewals on the Cumberland division of the Baltimore & Ohio included the re-laying of 4½ miles each of the third and fourth tracks on the Patterson Creek cut off with new 100-lb. A. R. A. Section B rail, replacing rail of the same section and weight. Standard 39-ft. rail with heavy plain six-hole angle bars were used.

The material for the renewal work was distributed by the work trains with the understanding that a Madden track laying machine would be used in laying the rail. Consequently the new rail was unloaded on the outside of each running rail, in the center ditch and on the ballast shoulder. There are 10 curves in this section of track, ranging from two to six degrees, and in order to provide the proper number and length of short rails for the low sides of the curves to maintain a uniform stagger of joints, the lengths of the high and low rails were carefully calculated. The work train foreman was properly instructed and furnished with a list of the short rails required for the given points, and these rails were placed where needed, joining up with the standard 39-ft. rails, so that the work of carrying or shifting rail with the machine would be reduced to a minimum. The angle bars, bolts, spikes, anti-creepers and tie plugs needed for the work were unloaded and distributed at the time that the new rail was unloaded, and care was exercised to see that material would be available where needed when laying rail to avoid unnecessary trucking or carrying.

Equip Machine with Rollers

The Madden track laying machines have been in use on the Cumberland division for several years, using the light rail which is furnished as part of the equipment for moving the machine back and forth when setting in the new rail, and some very good records have been made, but it was found that the output of the machine was limited to some extent as to the number of rails per hour which could be set in place, due to the unstable bearing afforded by the small rail and because of the trouble experienced in moving or carrying the little rail along with the machine. In order to overcome this difficulty a set of rollers, equipped with babbitt bearings, was placed on the lower part of the frame, additional bracing was added, and other slight changes made in the machine, as shown in one of the pictures, which eliminated the use of the small rail. The benefits derived from these changes are clearly shown in the performance statement, and indicate that the small expenditure necessary and the effort put forth in adding the rollers was fully justified.

The work of laying the new rail was carried on for four consecutive days, March 18, 19, 20 and 21, 1925, with one track laying machine improved as explained above. The track was turned over to the rail gang for the day, and all trains were run on adjoining tracks until this track was again closed and put in service at the end of the work day. Each day the gang started at one end of the 4½-mile stretch of track and carried the work to the other end, relaying one string of rail for the entire distance. Tie plates were renewed in the last 18 months, consequently it was not necessary to change them out when relaying the rail.

All of the spikes were drawn along the inside of the rail to be changed out and an occasional joint was disconnected to simplify the handling of rail in track. The old rail was then moved in toward the center of

the track a sufficient distance to allow space for setting in the new rail and at the same time serve as a support for the rollers under the machine. This method of moving the old rail in also served to keep it out of the way of the new rail during the operation of setting in. The new rail was then spiked down, and joints applied and bolted up, after which, the old rail was thrown out either into the center ditch or outside of

The Madden Rail Layer as Modified

the track as was found most convenient. A gang followed close behind and surfaced all loose ties while another gang brought up the rear, applying anti-creepers. The track was closed at the end of the day with every detail taken care of so that the next day's run could be made without being hampered by work left undone the previous day.

The Performance Record

The highest number of rails set in with the machine in any one hour was 107, while the average for the entire four days' run was a little over 80 an hour. Following is a detailed statement of performance for each of the four days and the time consumed:

	Feet of rail laid	Number of rails	Tons of rail	Men, including foremen	Man hours
March 18	23,258	598	346.1	58	528
March 19	23,215	597	345.5	58	526
March 20	23,153	597	344.5	59	542
March 21	23,283	600	346.3	60	540
Total	92,909	2,392	1,382.4		2,136

Total cost of laying.....$918.48
Average rate of pay..... .43
Laying cost per ton..... .66.44

	Track opened	Track closed	Lunch period	Actual time laying
March 18	8:07 a. m.	4:12 p. m.	30 min.	7 hr. 35 min.
March 19	8:08 a. m.	4:15 p. m.	30 min.	7 hr. 37 min.
March 20	8:21 a. m.	4:20 p. m.	30 min.	7 hr. 29 min.
March 21	8:20 a. m.	4:00 p. m.	30 min.	7 hr. 10 min.
				29 hr. 51 min.

Average number of rails set in per hour..... 80.13
Average feet of rail set in per hour..... 3,112.5
Detention: March 20, 40 min.; March 21, 35 min., on work train unloading new rail to fill out gap to enable rail gang to complete run.

The organization of the force necessary to lay 600 rails per day (which was the goal) was carefully planned in detail with the supervisory force several days before the work was started, using the outline found to be most efficient in previous performances of smaller scope as a basis. The primary object was to build up a well-balanced force so that each unit would keep pace with the preceding one, and at the same time have sufficient force in all of the units to insure the completion of the day's work and reach the objective.

Only two small extra gangs were available for the work which made it necessary to draw in the track forces from the adjoining sections to build up a rail gang of sufficient size to carry out the program. This assembling of section forces carried with it seven foremen who came with their gangs in addition to the two foremen of the extra gangs, making a total of nine foremen, which the casual observer may consider to be too much supervision, but in actual performance it proved to be a valuable asset in the organization. Following is an outline of the force used in each unit of the rail gang:

1 foreman and 11 men pulling spikes and disconnecting an occasional joint.
1 foreman and 3 men moving old rail in.
1 man pulling spikes outside where old joints were.
1 foreman and 5 men operating Madden machine.
1 foreman and 2 men temporary spiking of new rail.
2 men distributing joint material convenient for use.
1 foreman and 11 men placing angle bars and full bolting.
1 foreman and 11 men full spiking.
1 foreman and 4 men throwing out old rail.
1 waterboy.

7 foremen and 51 men

The following force was used in addition to the rail gang:

1 foreman and 10 men surfacing up loose ties.
1 foreman and 6 men applying anti-creepers and drilling for bond wires.

On March 20, one additional man was put in the gang pulling spikes.
On March 21, one additional man was put in the gang bolting.

The Gangs Moving Ahead

The foremen and gangs assigned to the various tasks on the first day were continued on the same work for the entire four days' run. The entire organization as outlined above proved to be very well balanced. The record made in average feet of rail per man per day, as well as the record average number of rails set in per hour for a sustained performance covering a period of four days' work with a small organization, is the best known record on the Baltimore & Ohio, and so far as is known has not been equaled on

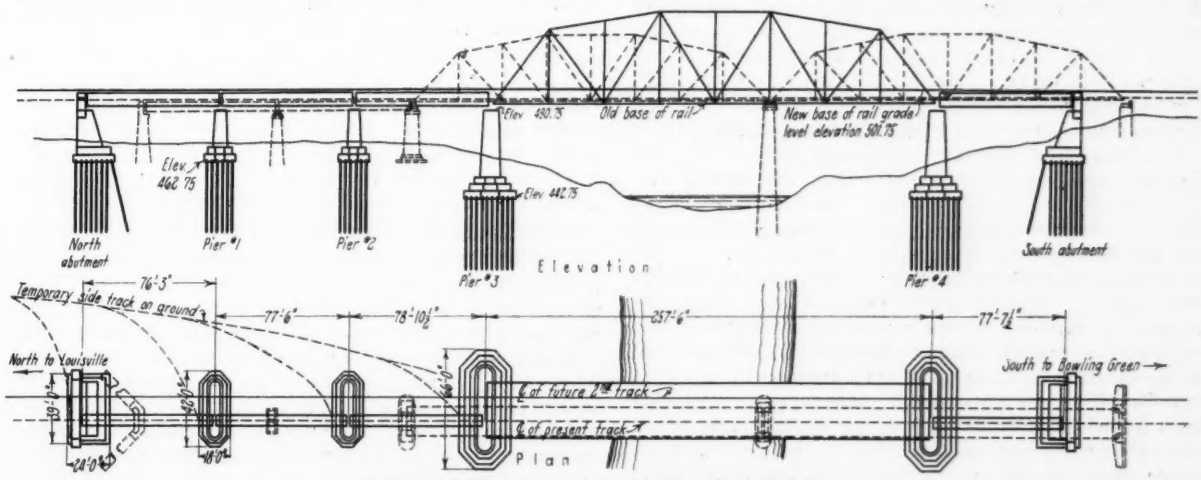
any railroad in the United States. The hearty co-operation of all foremen and men, together with the active interest displayed by them in carrying on the work, is largely responsible for the good showing which we were able to make, and they are entitled to a large measure of the credit. The work was performed under the direct supervision of I. S. Sponseller, general supervisor. W. R. House, supervisor, handled the advance units; F. A. Ernst, levelman, who followed the work of setting in new rail with the Madden machine, and M. B. Jones, assistant division engineer, who looked after the spiking and bolting to see that all work was complete as the units in the rear advanced.

The record performance made in this instance only emphasizes the necessity and importance of the careful planning and scheduling of every detail of the work to be performed, as well as the proper selection and assignment of forces. Sufficient supervision should then be provided to direct the forces to insure the completion of the plan on schedule time, as was done in the case detailed herein.

Falsework Permits Erection of Bridge Without Obstructing Traffic

By J. M. Salmon
Bridge Engineer, Louisville & Nashville, Louisville, Ky.

THE Louisville & Nashville recently rebuilt a bridge over Rolling Fork river, 30 miles south of Louisville, Ky., with its own forces in accordance with a plan that insured a minimum of interference with traffic. The old bridge, which was a single-track structure consisting of two through truss spans 204 ft. long and two deck girder spans 75 ft. long on a masonry substructure, was replaced by a 256-ft. double-track through truss span and four 75-ft. deck girder spans for single track on double-track piers and abutments on pile foundations. The work included the construction of the new masonry (four piers and two abutments) the removal of the masonry and superstructure of the old bridge, the raising of the grade and the erecting of the new spans.

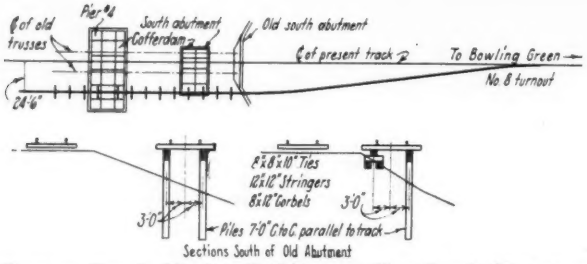


Plan and Elevation of the Rolling Fork Bridge

The new bridge has been located so that the center line of the west or southward track of the completed double-track structure coincides with the center line of the operated single track, and the four new single-track girder spans were erected to center on this alinement. The entire substructure, however, has been completed ready to receive the girders for the second track whenever authorized.

While there were 18 scheduled trains during the working hours, the allotted time for completing the masonry work made it necessary to adopt methods which would expedite and keep the work going without interruption from trains. To avoid interference with traffic, nearly all of the work connected with building the north abutment and Piers 1, 2 and 3 was handled from a temporary side track about 1,200 ft. long, laid along the foot of the fill and on the river bank within reach of Pier 3. This track, which was shifted to suit the work as it progressed, was used by a locomotive crane and a track pile driver to handle the excavation, cofferdam, pile driving and masonry work. At the south end of the bridge a temporary side track on a pile trestle was extended out in the river a sufficient distance to construct the south abutment and Pier 4.

After the masonry was completed the old bridge and embankment approaches were raised about five feet under traffic to bring the track to the new grade line. Falsework was then constructed from the south abutment to Pier 3 for the removal of the old truss spans and the erection of the new double-track truss span. This was made wide enough so that the pile driver and locomotive crane could move along a track outside the old truss spans on the east side. This track was supported for the remaining distance across the bridge by erecting the new girder spans in a temporary position on the line of the future second main track, and by connecting it to the operated main track at each end of the bridge it could be used as a tem-



Turnout Trestle Used in Building the New South Abutment and Pier 4

porary second or alternate track across the bridge. After the old truss spans were dismantled, it was possible to work on the erection of the new truss span from either track or divert main line traffic over either track. After the truss span was completed the old girder spans were removed and the new girder spans were skidded into their final place between trains.

Rolling Fork River is subject to sudden high rises, consequently, the erection work was timed to begin during the most favorable season and every effort made to complete it before a flood time. The truss span was almost ready to swing when a sudden rise occurred which filled the river with driftwood, but with no loss to falsework. But just after the span was swung, another sudden rise occurred, which took out some of the falsework and filled the river again with driftwood. After the falsework was removed a third rise occurred which cleared the river of all accumulated driftwood.

A novel feature of this bridge, although not an entirely new idea, was the use of oil-tight boxes to house all of the expansion rollers to keep the roller bearings for the spans clean and free from rust. All the work was under the direction of W. H. Courtenay, chief engineer, and the writer. J. E. Rawlinson, supervisor of bridges and buildings of the Louisville division, was in charge of all the field work.

"Single-Tracking" Helps Rail Laying on Multiple Track Lines*

By P. J. McAndrews
Roadmaster, Chicago & North Western, Sterling, Ill.

IN THE PERIOD preceding the double or multiple tracking of our trunk lines, rail was laid under the difficulties of heavy-traffic, single-track operation and this brought about the practice of setting up rail on the tie ends and of throwing in the strings with the least possible delay to trains, the switchpoint connection being used for quick "close ups." By that method the work was done in a generally satisfactory way.

Following the increase in double-track mileage a plan of relaying rail by diverting the traffic during certain periods of the day to one of the tracks for the distance between adjacent stations, came into vogue and has been gradually extended until it has now become a rather common practice, although an instance was recently related to the writer of an important trunk line railroad whose operating manager is not willing to co-operate with the maintenance department to the extent of giving up a track even for part of the day to rail laying operations. Fortunately, there has been little difficulty in convincing most operating officers that co-operation with those in charge of maintenance work means more dollars and less trouble for the railway, and the giving up of one line of double or multiple track lines for all or a part of the day for this work is becoming more general.

On lines having both trailing and facing cross-overs at each station or close enough together for economical operation it should be and is a simple matter to carry out the plan of temporary single-track operation for short distances, while on lines where the most of the cross-overs are trailing, this plan entails back-over movements. The delays and hazards introduced by such movements have led to the practice of installing temporary facing cross-overs where necessary and this plan was adopted in carrying out rail renewals on the Galena division of the Chicago & North Western in 1924.

Stations on this division, outside of the Chicago terminal and suburban district, average six to seven miles apart and it has been concluded that the labor expense of installing and removing temporary cross-overs when required at such intervals is justified by the savings effected through this plan.

A standard No. 10 cross-over is used, weaving in track ties instead of providing standard switch ties except at the frog, where seven switch ties are inserted, two being placed at each joint and three under and adjacent to the frog point. The cost of installing and removing such a cross-over approximates $100.

How Trains Are Handled Over the Single Track

Another special arrangement in this connection is to place at the temporary cross-over and also at the normal cross-over at the next station, small cabins for an operator and a special dispatcher. These are equipped with a telegraph wire for blocking and communication from end to end of the single track district and a train dispatching phone so that the local dispatcher may communicate with the division dispatcher at headquarters, and keep himself informed as to the arrival of trains, their importance, etc. Each of these cabins is equipped with a "Nunn" train order signal which is of light construction and easily installed.

With this arrangement of cross-overs and cabins the work is carried out as follows:

A local train dispatcher (usually an extra dispatcher from the chief's office) takes charge at the cabin stationed at the end of the single track, the approach to which is in the normal direction of traffic, with an operator at the other end, this local dispatcher being in absolute control of movements through that district.

The roadmaster or his assistant advises the division chief dispatcher as to the location of the single track district in which, and during what hours of the day the steel gang will use one of the tracks. The dispatcher in turn issues a 19 order in the following form to all trains leaving terminals:

"Effective at *time*.....*date* and during the life of this order, the *eastward (or westward, as the case may be)* track will be used as single track between the hours of (*time*) and (*time*) between the temporary facing cross-over located at (*indicate location*) and the cross-over at (*indicate location*).

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago, on April 14, 1925.

Telegraph offices with Nunn train order signals are located at each of these cross-overs, and between these hours, trains in either direction will be governed by the position of the train order signal.

If the signal shows a clear indication, and in addition a proceed signal is given by the train dispatcher or operator on duty, trains may proceed without further orders.

In addition to the order quoted above, instructions are bulletined limiting the speed over cross-overs.

Steel Gang Works without Regard to Traffic

With the absolute protection provided as outlined, the steel gang may work on the specified section of track without regard to traffic within the specified hours. Work trains are also permitted to operate on the track being relaid, through an understanding with the local dispatcher.

Arrangements are made so that the required temporary cross-over is installed sufficiently in advance of the need at the next station so that when one district is completed the advance may be made to the next without delay. Cabins are moved either on the work train or by motor car and trailer, the cabins being small and light enough to be so handled. During the time necessary for the change we have usually been able to use passing sidings for train movements through stations while the steel gang continued the work through the yard.

While such items as the cost of cutting wires into these cabins, etc., enters into the relaying cost, it is, as a matter of fact, usually done by local linemen without delay to their other work. The expense of the employment of the train dispatcher and operator is in a measure offset by the saving of flagmen which are unnecessary under the plan.

With the uninterrupted use of the track for the entire working day the unloading, relaying and cleaning up of the rail can be carried on without delay and an organization sufficient for the entire operation should be provided.

The record made last year consisted in unloading material including rail and switches, relaying 18 miles of track and 17 switches, disconnecting all the old rail and loading about 50 per cent of it in 18 days with an average force of approximately 115 men. Section men, however, applied all rail anchors and the necessary track shims to take care of uneven places in surface to avoid damage to the new rail. The rail was unloaded with the use of an air rail loader and was laid by a gasoline-driven machine built and designed by Roberts Brothers, Chicago, railroad contractors. This machine also handled men to and from the working points on trailers.

It is not always practicable to have new rail received at the time and in the quantities suitable for distribution immediately ahead of the steel gang, and it is sometimes difficult to secure information as to the disposition for old rail immediately, but where this can be done, it is advantageous to conduct the entire operation simultaneously.

It is of interest to record the actual delays to traffic during the 18 days that this operation was in progress. In that period 153 passenger trains were handled with an average delay of 39 sec. each, and 318 freight trains with an average delay of a small fraction over three minutes each, the latter figure including delays to all classes of freight, the greatest delays being to local freights having short divisions which did not result in overtime to the crews. The total delay to freights amounted to a little over 15 hours or less than one hour per day for the total of about 17 freight trains per day.

Rail Production Less In 1924

ACCORDING to statistics of the American Iron and Steel Institute the production of rails in the United States was 471,184 gross tons less during 1924 than in 1923. Last year the production totaled 2,433,332 tons, whereas the total in 1923 was 2,904,516 tons. However, the total for 1924 is considerably greater than for either 1921 or 1922. The range of rail production from 1908 to 1924, inclusive, is shown in the table below.

PRODUCTION OF RALS BY PROCESSES, GROSS TONS, 1910-1924

Years	Open-hearth	Bessemer	Rerolled*	Electric	Iron	Total
1910	1,751,359	1,884,442	.....	†	230	3,636,031
1911	1,676,923	1,053,420	91,751	462	234	3,822,790
1912	2,105,144	1,099,926	119,939	3,455	.....	3,327,915
1913	2,527,710	817,591	155,043	2,436	.....	3,502,780
1914	1,525,851	323,897	95,169	178	.....	1,945,095
1915	1,775,168	326,952	102,083	.....	.....	2,204,203
1916	2,269,600	440,092	144,826	.....	.....	2,854,518
1917	2,292,197	533,325	118,639	.....	.....	2,944,161
1918	1,945,443	494,193	101,256	.....	.....	2,540,892
1919	1,893,250	214,121	96,422	50	.....	2,203,843
1920	2,334,222	142,899	126,698	297	.....	2,604,116
1921	2,027,215	55,559	96,039	5	.....	2,178,818
1922	2,033,000	22,317	116,459	.....	.....	2,171,776
1923	2,738,779	25,877	139,742	118	.....	2,904,516
1924	2,307,533	16,069	109,730	.....	.....	2,433,332

*Rerolled from old steel rails. Included with Bessemer and open-hearth steel rails in 1910. †Small tonnage rolled in 1910, but included with Bessemer and open-hearth rails for that year.

The above table indicates also the progressive decline in the production of Bessemer rails which during 1924 was less than for any previous year. The 16,069 tons produced last year was so small as to be virtually negligible. The production of rails as shown in the table includes in addition to new rails rolled, rails rolled from defective rails and old rails. Particulars as to renewed and rerolled rails are given in the table below.

PRODUCTION OF RENEWED AND REROLLED RAILS, 1916-1924

	Rerolled from new seconds, new defective rails, etc.			Rolled from	Total
Years	Open-hearth	Bessemer	Total	old rails	rerolled
1916	1,711	2,149	3,860	144,826	148,686
1917	1,825	7,182	9,007	118,639	127,646
1918	13,296	19,462	32,758	101,256	134,014
1919	1,933	5,766	7,699	96,422	104,121
1920	19,493	1,979	21,472	126,698	148,170
1921	6,525	702	7,227	96,039	103,266
1922	996	.....	996	116,459	117,455
1923	16,640	561	17,201	139,742	156,943
1924	11,325	453	11,778	109,730	121,508

The tendency toward the use of heavier weights of rails received a moderate setback last year. Thus during 1923 the production of rails weighing 100 lb. per yd. or more totaled 1,465,850 tons and represented 50.5 per cent of the total tonnage, while the output of these rails for 1924 amounted to only 1,175,581 tons or 48.3 per cent of the total tonnage of all weights of rail rolled during the year.

PRODUCTION OF RAILS BY WEIGHT PER YARD, 1908-1924

Years	Under 45 pounds	45 and less than 85	85 and less than 100	100 pounds and over	Total gross tons
1908	183,869	687,632	1,049,514		1,921,015
1909	255,726	1,024,856	1,743,263		3,023,845
1910	260,709	1,275,339	2,099,983		3,636,031
1911	218,758	1,067,696	1,536,336		2,822,790
1912	248,672	1,118,592	1,960,651		3,327,915
1913	270,405*	967,313†	2,265,062		3,502,780
1914	238,423*	309,865†	868,104	528,703	1,945,095
1915	254,101*	518,291†	742,816	688,995	2,204,203
1916	295,535*	566,791†	1,225,341	766,851	2,854,518
1917	308,258*	882,673†	989,704	763,526	2,944,161
1918	395,124*	665,165†	888,141	592,462	2,540,892
1919	263,803*	495,577†	965,571	478,892	2,203,843
1920	489,043*	433,333†	952,622	729,118	2,604,116
1921	211,568*	214,936†	902,748	849,566	2,178,818
1922	265,541*	274,731†	728,604	902,900	2,171,776
1923	272,794*	300,907†	864,965	1,465,850	2,904,516
1924	191,046*	213,274†	853,431	1,175,581	2,433,332

*Includes rails under 50 pounds. †Includes 50 pounds and less than 85 pounds.

While the tonnage of rails weighing 85 lb. and less than 100 lb. per yd. rolled during 1924 was slightly less than for 1923, it actually represents a larger proportion of the tonnage than in the case of the year preced-

ing. Rails of this weight represented 35.1 per cent of the total of 1924, as compared with 29.7 per cent in 1923.

PRODUCTION OF RAILS, SHOWING DECREASE BY PROCESSES, GROSS TONS, 1923-1924

Kinds	1923	Per cent	1924	Per cent	Decrease	Per cent
Open-hearth	2,738,779	94.29	2,307,533	94.83	431,246	15.75
Bessemer	25,877	0.89	16,069	0.66	9,808	37.90
All other	139,860	4.82	109,730	4.51	30,130	21.54
Total	2,904,516	100.00	2,433,332	100.00	471,184	16.22

New Gasoline Supply Car Improves Delivery Service

By L. B. Wood

General Storekeeper, Southern Pacific Lines, Houston, Tex.

A GASOLINE supply car equipped for distributing that very necessary, dangerous and expensive item of railway supply has just been put into service on the Southern Pacific, Texas and Louisiana Lines.

The tank is mounted and fastened securely on a steel underframe 80,000-lb. capacity flat car of modern design. The tank of 6,000 gal. capacity was built of special rolled tank steel in the Houston shops. The lower section, which is in one piece, 72 in. by 370 in., provides a solid bottom for the tank. The seams have two rows of rivets spaced 2 in. apart. Splash plates are so arranged that danger of the car getting into a rocking motion is entirely eliminated. There is no outlet in the bottom of the tank, except a 2 in. hole for cleaning as necessity requires. This is closed with a plug securely jammed and locked.

Filling is done through the dome and the suction line enters the top of the tank at one end. Gasoline is handled through a 5-gal. self-measuring pump equipped with an indicator and meter registering up to 100,000 gal. A cabin for housing the pump and pipe work, 6 ft. 2 in. by 7 ft. 6 in., is well braced and securely anchored to the car at one end with tie rods. Two 50-ft. lengths of 1-in. steel-clad hose are provided to serve each side of the car, the gasoline being delivered through a quick action two-way valve installed at the outlet of the pump which permits the operator to turn the flow in to either side of the train. The outlet of the hose is equipped with a cut-off nozzle to avoid delay in draining and to permit a quick cut off of the gasoline if occasion should require. Deliveries of from 25 to 60 gal. are made in 6 min.

The advantage of delivering the exact quantities needed as compared with drum lot issues, the elimination of voluminous drum records and the saving of the difference in purchase price between drum and bulk-lot gasoline have alone made the installation of underground tanks and the delivery car a good investment. In the construction of the car full cognizance was taken of the regulations of the Insurance Underwriter's and the Bureau of Explosives.

Deliveries are made to underground tanks buried adjacent to tool houses, the gasoline being served from these tanks through a small hand-operated pump placed inside the house. Approximately 500 of these small storage tanks and pumps were installed preparatory to instituting the practice of delivering gasoline from the tank car.

These lines traverse the great oil fields in Texas and Louisiana where ample supplies direct from the refinery are available from the storage tanks of the oil companies. It will be of interest to roads not so fortunately situated to know that this car will serve 2,400 miles of railroad without the installation of a storage or distributing tank. This permits the use of a small tank which, in maintaining a well balanced load, eliminates the restriction on the speed of the train which might be required with a larger capacity tank. It is necessary to operate the supply train at the maximum speed allowed freight trains on a number of districts which range from 150 to 170 miles in length in order to cover them in the allotted time.

Gasoline is Delivered from the Car While the Tool Inspection is in Progress

The accompanying photograph shows a delivery being made to a section tool house. This is a typical illustration of procedure upon the arrival of the train and shows, from left to right, the supply train storekeeper, the section foreman, the roadmaster and the division engineer making an inspection of tools which have been systematically arranged for the purpose. The operator can be seen inside the cab making a delivery of gasoline.

New Water Facilities at Russell, Ky. Insure Adequate Supply

Chesapeake & Ohio Rebuilds and Enlarges Plant to Meet Exacting Requirements of Important Terminal

THE CHESAPEAKE & OHIO is completing the installation of improved water supply facilities at the Russell, Ky., terminal which involve features not ordinarily found in railway water supply. The Russell terminal is located on the Ohio river in the northeastern corner of Kentucky, near the West Virginia and Ohio state lines and is the main point for the assembling and classification of the heavy coal traffic originating on the railroad in the West Virginia and eastern Kentucky coal fields. By way of example, records for January 10, 1925, a typical (not maximum)

Looking Down the Slope of the River Bank at the Old Portable Steam Pumping Units

day for heavy movement, show that 152 trains were required to handle 11,060 cars in and out of this terminal, in addition to which there were 35 engines in yard service. The terminal embodies approximately 130 miles of main and yard tracks and dispatches from 90 to 115 engines per day.

Due to the importance of regular and systematic service in this terminal, it is essential that no possibility for interruption be permitted. The effect of a water shortage at this point with the resulting delay to yard movements would be felt over the entire system and would cause an enormous loss. The present water consumption amounts to approximately 1,500,000 gal. per day. Consequently, the insuring of a permanent and continuous supply to take care of these demands and provide for future increase in business is of the utmost importance.

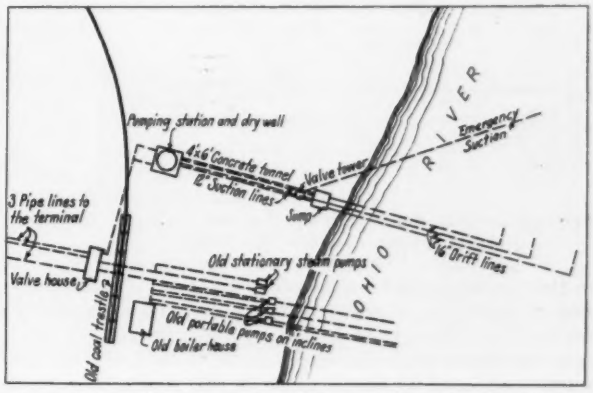
The only practicable source for so large a quantity of water near this locality is the Ohio river, which flows peaceably by during dry weather, but occasionally reaches unmanageable proportions following spring rains, or the melting of snow. The variation in the river stage at this point is approximately 66 ft.

Quality of Water Unsatisfactory

The quality of the Ohio river for boiler purposes differs to some extent from the usual surface stream. During the wet season a rise in stage is accompanied by a heavy sand flow which is particularly hard on pumping machinery and causes further difficulty due to floating debris. During the dry season the quality is influenced to a more or less appreciable extent by the acid drainage from the Pennsylvania, West Virginia and Kentucky coal fields. This pollution has caused serious trouble and heavy expense from the corrosion of boiler tubes and sheets.

The cost of the damage incurred in this manner was responsible for the installation of a lime and soda ash water softening plant at Russell in 1918. This consisted of a steel tank, 30 ft. in diameter by 80 ft. high with a 7½-ft. down-take tube. The chemical proportioning was handled with Graver Type K apparatus, at a rated capacity of 80,000 gal. per hour. This overcame the scaling and corrosive tendency of the water but with an upflow of 10 ft. per hour some of the mud and sediment were carried over into the storage tanks instead of settling out in the softener. Copperas was used to hasten the sedimentation but the improved results secured with sodium aluminate have since caused the retirement of the copperas equipment.

Formerly the pumping equipment comprised a steam plant. Steam was generated in one 125-hp. Erie-type water-tube boiler and two 75-hp. locomotive-type boilers. Three 14-in. by 10¼-in. by 10-in. duplex pumps were mounted on carriages so that they could be moved up or down the river bank to meet the varying water stages. Under ordinary conditions water was pumped by two 14-in. by 25-in. by 13-in. by 24-in. compound pumps, mounted on a stationary platform approximately half way down the bank. Connections were made from all pumps into a header from which



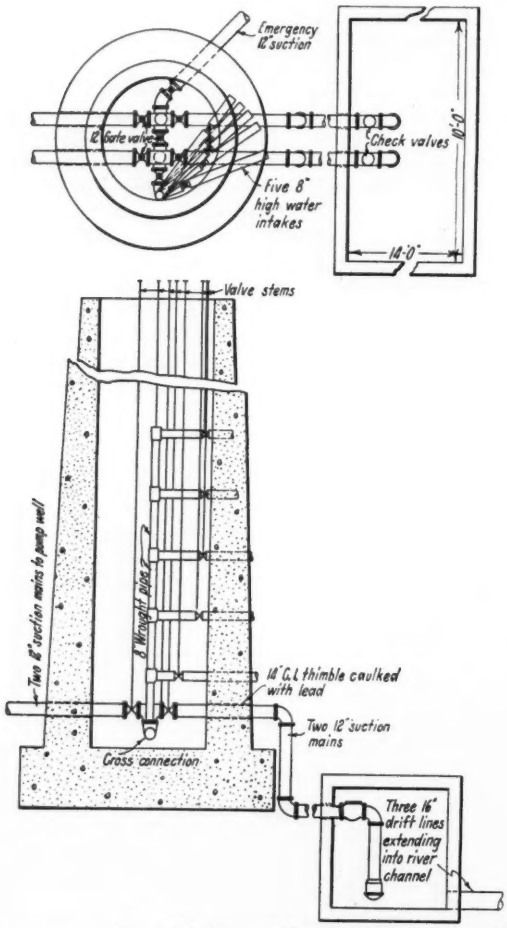
Plan of the Piping and the Old and New Pumping Units on the River Bank

three cast iron discharge lines, 6 in., 8 in. and 10 in. in diameter, connected with the treating tank and the shops.

Because of the expense of steam operation and the heavy repairs to the multiplicity of small pump valves, an electric station was designed and installed in 1920. This consisted of duplicate units of triplex pumps, each operated by a direct connected 125-hp. motor. To take care of varying river stages, a concrete dry well, 20 ft. in diameter by 55 ft. deep, was constructed

on the river bank with its top one foot above maximum high water. The 14-in. by 12-in. pump cylinders with valve bodies were located in the bottom of the well with the motors and power heads in a house at the top of the pit, being connected to the cylinders by rods supported in a heavy frame work. Suction lines were laid from the well to the river through a tunnel and were equipped with strainers with ¾-in. openings.

The triplex pumping installation did not prove successful. Sand continued to give trouble with the plunger type pumps, causing heavy maintenance expense after but short service. Serious wear occurred



Arrangements of the Piping and Suction Lines in the Valve Tower and Suction Intake

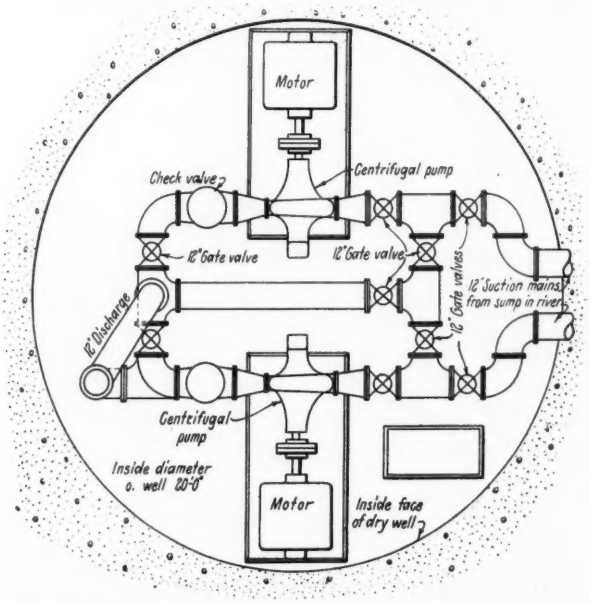
in the moving parts of the heavy machinery with additional expensive repairs. Due to lack of dependable service from the triplex units, it was necessary to retain the steam plant in service and, in fact, the steam units continued to pump most of the water.

Because of these difficulties, authority was secured in 1923 for an improvement of the water supply facilities at Russell. This consisted in part of replacing the triplex pumps with electric-driven, direct-connected, horizontal, single-stage centrifugal pumps. A study of relative efficiencies demonstrated that the situation could be handled best with single-stage, split-cased, centrifugal pumps having 6-in. discharge and 8-in. suction openings, which would deliver 1,500 gal. per min. against a maximum total head of 187 ft. and operated by direct-connected 100-hp. motors. The pump impellers were so designed that they would cut off at 1,800 gal. per min. to relieve the possibility of overloading the motors during periods of high river stages.

The triplex pumps with their massive supports were removed from the concrete dry well and the small electric pumps were installed on concrete foundations in the bottom. The old 16-in. flanged-end, cast iron pipe suction lines were removed and replaced with 12-in. wrought screw pipes which were cross-connected and equipped with valves so that either suction line can be used by either pump. Another connection was provided so that either suction line can be back-washed by operating the opposite pump.

Provide Improved Suction Intake

A suitable suction intake was of considerable importance to avoid the heavy sand flows which follow the river bottom during floods. A concrete sump, 10 ft. by 14 ft. by 10 ft. deep was installed and provided



How the Pumping Units, Motors and Piping Are Arranged in the Dry Well

with three 16-in. drift lines extending out into the main river channel from near the bottom of this sump. These drift lines were equipped with screens at their river ends which were turned down stream and were provided with valves in the sump which can be closed when the sump is being cleaned. The maximum velocity in the drift lines when the pumps are working to full capacity would be but about 1.1 ft. per sec. which is considered sufficiently low to avoid drawing in appreciable amounts of heavy sand and sediment which would interfere with the operation of the drift lines and the sump.

To provide for cases of exceptionally high water which had previously caused excessive trouble, a concrete intake tower was erected near the outer end of the suction line tunnel. This has an inside diameter of 10 ft. and its top is at the same elevation as the top of the dry well with which it is connected by a two-span steel foot bridge, the longer and outer span being 135 ft. long. On the down stream side of the intake tower, five grated openings were provided, five feet apart vertically, which were connected to the main 12-in. suction lines in the base of the tower by 8-in. wrought pipes. This smaller size of pipe was used to introduce an increase in friction as a means of main-

taining a more uniform head on the pumps which has already varied from a minimum of 15 in. of vacuum at low water stages to 38 ft. of static head at flood stage.

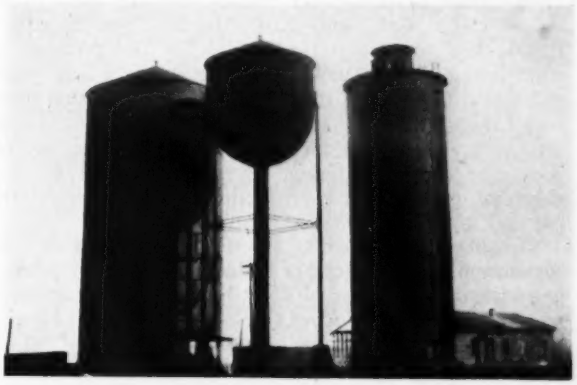
The intake tower is located directly over the two 12-in. suction lines between the sump and the dry well and a cross connection between the two lines is provided where they pass through the tower. One end of this cross line is connected to the 8-in. riser connecting to each of the five tower intakes while the other end leads out into the river channel to serve as a 12-in. emergency suction line.

Over the intake tower a valve house was constructed from which the valves to each intake opening and all valves on the suction lines and cross connections are controlled from valve stands with extension stems. This permits taking water from near the surface during floods with consequent betterment of conditions. It also provides for the selective use of one or both of the lines into the dry well with water from any of the intakes.

Amplify Storage Capacity

Formerly the storage facilities were also inadequate, consisting of but two 100,000-gal. tanks, one a hemispherical bottom steel tank 75 ft. high and the other a 20-ft. by 30-ft. wood tub on a steel frame. During busy periods of the day the 200,000-gal. storage would be dissipated in a single hour which allowed but a short period in which to make any emergency repairs to pumping units. To correct this deficiency an additional storage tank was erected adjacent to the old steel tank. This is a flat-bottom standpipe 40 ft. in diameter by 74 ft. high with a downtake tube in the center 12 ft. in diameter. A sludge collecting system of piping was provided in the bottom to permit the removal of the accumulation of sediment. The water is brought to the top of this tank through a 12-in. line from the treating tank, from which it descends through the 12-ft. tube to rise 22 ft. from the bottom before going to water columns and the distribution system through a 16-in. pipe. This allows 2½ hours additional time for sedimentation with a vertical velocity of 8 ft. per hour which has aided materially in the clarification of the supply. This tank added 525,000 gal. to the available storage.

Formerly there was no provision for furnishing water to locomotives at the west end of the yard which is approximately three miles from the roundhouse and main water column supply. To assist in taking care of present operations and provide for future extensions, a 12-in. cast iron gravity line was installed from the tank near the roundhouse to the west end where an additional flat bottom steel standpipe 40 ft. in diameter by 53 ft. high was erected for storage purposes and three standard 10-in. water columns were installed for delivery to locomotives. The usual precautions were taken in laying the gravity line as near level as possible, with air vents at the summits and blow-off connections in the sags. This tank increased the available storage 375,000 gal., so that the station now has a total storage of 1,100,000 gal., which should be ample to take care of occasional temporary power failure or accident to the lines.



The Storage Tanks and Treating Plant

The electrically driven centrifugal pumps have now been in service continuously since February, 1924, with the exception of a period in the spring and early summer while suction connections were being completed. Their efficiency in handling the supply has been fully demonstrated. The reduction in power costs are amounting to an average of 55 per cent. The maintenance has been practically negligible and the records show a monthly reduction of 32 to 74 per cent in the labor and material required for maintenance as compared with similar months in the previous year with the former facilities. There appears to be no reason why this plant should not continue to function in a satisfactory manner.

The Electric Pumping Plant and the Valve Tower Are Connected by a Bridge

The new facilities were designed by R. C. Bardwell, superintendent, water supply, under the supervision of L. B. Allen, superintendent maintenance of way, and installed by contract under the direction of C. W. Johns, chief engineer.

Fine Sand Causes Trouble In Tunnel

Line Change at Rocky Point on Southern Pacific Coast Line Presents Unusual Problems

AS PART of a program for shortening the running time of passenger trains between San Francisco, Cal., and Los Angeles, the Southern Pacific has constructed a tunnel for the purpose of eliminating sharp curvature on its Coast line eight miles north of King City. The Coast line in this territory follows the Salinas river and in the original construction at Rocky Point the line was swung out toward the river by 10-deg. reverse curves to avoid a ridge of granite rock projecting sharply above the general level of the Salinas valley.

The sharp curvature of the detour imposed definite restrictions on the speed of trains and for many years a permanent slow order of 25 miles per hour was maintained over the 3,167 ft. of track embraced in the series of curves. But with the increase of traffic to a daily movement of 14 first-class passenger trains and a heavy freight business this restriction became an operating burden no longer to be tolerated. The location is such that a tunnel through the shoulder of rock offered the only feasible means of improving the alinement.

The plan and profile illustrate the short line change carried out in connection with the tunnel construction. It reduces distance only 440 ft. but it affects a reduction of 158 deg. in curvature. The tunnel is 1,305 ft. long, 64 ft. of which is tangent, 210 ft. taper curve and 1,171 ft. two-degree curve. It is constructed to the standard width of 17 ft. for single track with 22 ft. clearance over the top of rail. It is lined with reinforced concrete throughout and has reinforced concrete inverts in each end.

Anticipated Stable Material

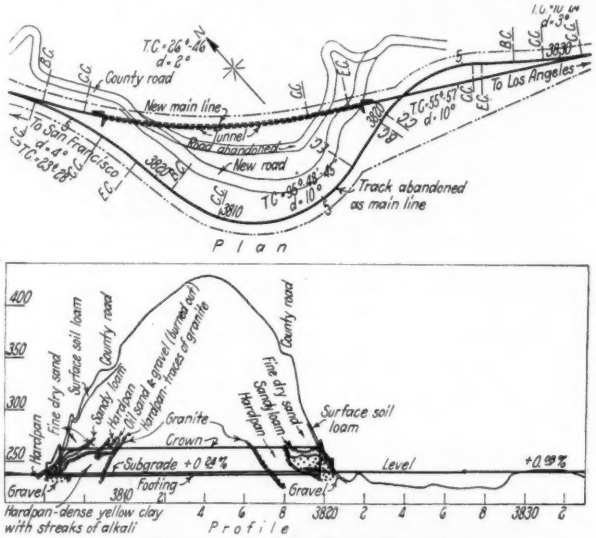
A generous surface outcropping of somewhat fissured granite was very much in evidence for 900 ft. on the face of the point, and this and other surface indications led to the conelusion that the soil overlaying the rock was of compact alluvial loam formation that would lend itself readily to the construction of portals and easy tunneling from both ends to the points where solid rock would be encountered. Excavation was started on the north end with a Marion 70-ton shovel served by three-foot gage equipment, but ground was hardly broken before a bed of very fine blow sand was encountered. This material was very dry with no vegetation to bind it and took a natural slope of approximately three to one.

In excavating for the portal, the slopes ran back so far that it was necessary to relocate a county road at the top of the slopes 90 ft. above grade. After the portal excavation was made a heavy timber bulkhead was set up on the sand slopes and three openings made in the bulkhead to permit the starting of three small drifts. Lagging was driven and the three drifts carried into the sand approximately five feet when a dry sand slide occurred and without warning approximately 1,500 cu. yd. of sand and loam top soil came down, completely collapsing the bulkhead and filling the drifts.

The portal site was again cleaned out with the steam shovel, a new bulkhead constructed of two thicknesses of 8-in. by 12-in. timbers set up at the foot of the sand slope at grade, then three-segment arches were set on sills and planked over with lagging to protect the workmen while three small drifts were again started under this cover. These drifts were located, one on each side of the tunnel section, approximately at the springing line and a third on center line at the crown of the arch.

How the Timbering Was Done

Square sets were framed of 6-in. by 8-in. timber and set to form a drift approximately 3½ ft. wide and 4½ ft. high. Lagging 2-in. by 6-in. approximately five feet long with beveled points driven forward at the sides and top of the drifts by hand completely enclosed the heading at the top and sides. In addition it was



Map and Profile of the Tunnel

necessary to keep the faces of the drifts protected by breast boards at all times and it was only on rare occasions in advancing the drifts that more than one 2-in. by 6-in. breast board could be removed at a time in order to drive the lagging forward. The sand was so dry and of such fine, uniformly sized grains that it was necessary to calk the space between the lagging and breast boards with wet hay, as it was soon found by costly experience that three or four cubic yards of sand would run through a very small space between lagging in an incredibly short time and completely fill the drift.

After the drifts were advanced a distance of approximately 16 ft., wall plates made of double 8-in. by 16-in. timbers 16 ft. long were brought into the drifts and set accurately to line and grade to receive arch timbers. This done, cross drifts were driven two feet in advance of the last arch set and five-segment arch timbers were set up and lagged back to the last completed arch. When driving these cross drifts it was also necessary to drive and maintain lagging in the cross drifts connecting the two lower wall plate drifts with the crown drift, thoroughly calked with wet hay to keep the sand out. In driving cross drifts the lagging in the wall plate and the crown drifts, had to be cut out by hand

saws working in the sand, to insert the lagging for the cross drifts. Later it was found that this lagging could be cut out to better advantage by the use of two-inch augers than it could be sawed.

But the Sand Continued to Come In

Even with the greatest care in driving the lagging forward and in keeping it thoroughly calked, sand came through cracks into the drifts and this resulted in a continual movement of the hillside over the tunnel. Large cracks formed in the surface coat of loam and from 10 to 100 ft. of this loose dry material, principally sand, lay as a dead yet slowly moving weight over the tops of the arch sets, with the result that the five-segment arches formed of 8 in. by 12 in. selected fir set on two foot centers were found hardly strong enough to carry the load. For this reason false posts were necessary at many points under each member of the five-segment arches. These false posts were set on foot blocks approximately at the grade of the bottoms of the wall plates.

The excavation of the bench or that section of the tunnel between the wall plates and grade (approximately 18 ft. in depth by 21 ft. in width) was removed in short sections usually four feet in length. The bench also had to be bulkheaded and calked with hay and it was necessary to follow up the bench excavation quickly with the concrete lining which was placed in sections from 12 to 16 ft. in length, according to the ground condition.

At the south end of the tunnel the contractor profited by experience at the north end and did not disturb the sand strata with the steam shovel but started three drifts in the surface loam on the natural slope. He was thus able to get under ground with less difficulty than at the north end. The general formation and the character of the sand, however, were similar to that at the north end and the same methods were used. In one instance a broken 2-in. by 6-in. lagging in one of the small drifts permitted sand to come in to the extent of approximately 20 cu. yd. before it could be stopped. This action formed a crater on the surface approximately 60 ft. above the drift grade.

Drift Section Distorted

Due to the fact that the headings entered the hill at an acute angle there was considerable movement almost crossways of the tunnel and at one time this movement so constricted the 3½-ft. by 4½-ft. drifts that it was impossible to use a wheelbarrow in them, the hole in the drift being barely large enough for a man to crawl in. Attempts were made to drive lagging for the small drifts with air hammers and to operate augers for the cross cutting with air but these were not successful and it proved more economical to drive the lagging with hand hammers or in some cases with a battering ram suspended from a rope and operated by hand. The forces in the drifts consisted of three men in each drift working three eight-hour shifts and the average progress made in the sand for the nine men for 24 hours was from two to three feet.

After prosecuting these tunneling methods through the sand for a distance of approximately 300 ft. in the north end of the tunnel and 200 ft. at the south end, hard pan was encountered after which the three drift system was continued without the necessity for full timbering. In the hard pan formation the average daily progress with a force of nine men per shift was 8 to 12 ft. per 24-hour period.

The concrete lining was carried forward as rapidly as the bench could be advanced and protected. In the sand formation the bench was excavated by hand for the reason that it was impossible to operate a shovel in the tunnel due to the large number of false posts and struts which had to be maintained in and across the tunnel until after the concrete was poured and had set. When disintegrated granite formation was encountered the wall plate drifts on each side of the tunnel were discontinued and center crown drifts approximately 8 ft. by 12 ft. were driven from each end until they met. Until the time the drifts met it was necessary to provide fresh air from each end, delivered from 20-hp. motor blower equipment through 14 in. air pipes. After the drifts met they were enlarged and worked simultaneously from each end, it being necessary to set wall plates and erect five-segment arch sets with lagging as it was found that the granite formation was so badly shattered, seamed and generally disintegrated that it would not support itself for the full width of the arch without timbering and lagging.

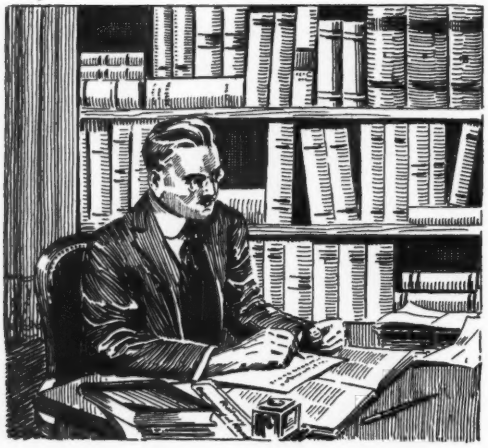
Work in Rock Easier

The spacing of the five-segment arches, however, was increased from two feet to four feet after rock was encountered. Excavation of the bench in the rock section was handled with a steam shovel operated by compressed air and equipped with a special tunnel boom and a 1½-cu. yd. dipper. Drills were also operated by compressed air piped into the tunnel from a central compressed plant comprising a compressor with a capacity of approximately 1,000 cu. ft. of free air per minute at a pressure of 90 lb. per sq. in., operated by a 200-hp. electric motor. The shovel was operated for the most part on two eight-hour shifts and averaged approximately 16 ft. per day or one foot per hour during the time the shovel was in operation. The third eight-hour shift was utilized for setting plumb posts under wall plates, lagging the side walls where necessary and shooting. The granite formation had evidently been badly shattered by volcanic or seismic action and the main seams ran at an angle of approximately 35 deg. from the vertical across the axis of the tunnel and while the rock was dry these seams were moist and coated with a fine talc paste which prevented cohesion between the masses of rock. In consequence the work necessitated very careful shooting and the installation of more timber than might be expected from an examination of the material on the spoil bank.

The granite rock encountered approximately 300 ft. inside the north portal and about the same distance inside of the south portal is badly shattered and shows a further tendency to disintegrate into coarse sand when exposed to the air. It is a much less stable material than that exposed in the out crop on the outside of Rocky Point and therefore required support during construction by timbering in order to insure safety of workmen.

A total of over 27,000 cu. yd. of excavation was required to complete the tunnel and over 5,900 cu. yd. of concrete and over 430,000 lb. of reinforcing steel was placed in the tunnel lining, inverts and portals with their protecting retaining walls. Actual construction work on the tunnel was started on December 3, 1922, and the first train, No. 72—Daylight Limited—ran through the tunnel on December 19, 1923. The construction was handled under the immediate jurisdiction of E. C. Morrison, division engineer of the Coast division, reporting to W. H. Kirkbride, engineer maintenance of way of the Pacific system. The Utah Construction Company was the contractor with A. J. Sartoris of Oakland, Cal., as sub-contractor.

What's the Answer?



This department is designed to serve as a reader's service bureau, wherein the many problems which arise in the routine maintenance of tracks, bridges, buildings and water service facilities, may be subjected to frank and thorough discussion. The value of the service thus rendered is proportionate to the extent to which readers avail themselves of it, in submitting questions and in lending their co-operation by offering answers to the questions presented.

Questions to be Answered in July

1. *What practical measures can be taken to prevent the overloading of motor cars?*
2. *What work required by carpenter forces can be done most effectively in a small carpenter shop at division headquarters and what tools or equipment, particularly power-operated equipment, should be provided?*
3. *Is it preferable to make fence repairs by section gangs or by special gangs?*
4. *Does the deterioration of roller expansion bearings on steel bridges and the expense of keeping them clean justify the added cost of providing dust boxes around such bearings on new bridges?*
5. *To what extent is it possible to increase the life of rail on curves by using high carbon rail, by oiling the side of the outside rail and by other expedients?*
6. *To what extent is it practical for a foreman to concentrate the care of switch lamps in one man? What are the advantages and disadvantages?*
7. *What are the qualifications of an inspector on contract building work? Should an experienced carpenter or carpenter foreman be assigned to this work or are younger members of the engineering force to be preferred?*
8. *What can be done to prevent the growth of vegetation in reservoirs?*

Train Annunciators for Crossing Flagmen

Is the installation of annunciators in crossing flagmen's shanties at points of limited or obscured vision to be recommended?

Found Helpful on the Erie

By J. C. Patterson

Regional Engineer, Erie Railroad, Jersey City, N. J.

Annunciators have been installed at various points on the Erie since 1900 and have proved advantageous, particularly at points where heavy fogs are experienced.

The trouble with a device of this kind is that the crossing watchman may in time rely entirely on it to warn him of the approach of trains and if the bell does not ring, as sometimes happens, the crossing is not protected. To guard against this condition, surprise tests are made from time to time by the crossing supervisor: (1) by riding on locomotives and observing how quickly the crossing is protected; (2) by placing an obstruction between the clapper and the bell while the gateman is not present and observing whether or not he performs his duty properly, although the bell does not ring, and (3) by approaching the grade crossing from the street and observing whether or not the crossing watchman goes out to protect the crossing prior to the ringing of the bell.

My experience leads me to believe that the device is to be recommended for points of limited or obscured vision, providing the crossing watchman is kept on the alert by surprise tests.

A test that is often made is to run a motor car over the division, which does not operate the circuit, and notice whether the watchman is on hand at the crossing to protect it. I believe this test to be one of the best, since the proper officers are on hand to observe the performance of the watchman and there is no dispute as to whether or not he actually did perform his duty.

Their Use a Reflection on Men

By D. F. Stevens

General Superintendent, Baltimore & Ohio, Cleveland, Ohio

If this recommendation were approved it would be an admission that our crossing watchmen are not alert and that gongs are required to warn them to wake up. In America the position of crossing watchman has generally been delegated to superannuated employees. Prior to the heavy automobile traffic the practice might have been permittable, but today it is improper. Our grade crossings are of too great importance to put them in the hands of old men. Furthermore, the tendency of the railroads is to supplant the crossing watchman with flashlight signals, which, in my opinion, as a railroad man and an automobile driver also, is infinitely better. It is an economical arrangement and removes from the service a class of unproductive labor. I would not recommend the installation of

annunciators in crossing flagmen's shanties at any point under any consideration. It is wrong in principle.

The Annunciators Should Be Large

By T. F. Donahoe

General Supervisor of Road, Baltimore & Ohio, Pittsburgh, Pa.

With the ever increasing number of automobiles and the present speed mania of drivers to make fast time, regardless of safety to themselves or others, any mechanical device should be used that will lead to greater safety. Any mechanical device such as an annunciator is a help to the watchman as it gives him the exact location of the train and the direction in which it is coming, which gives him ample time to get all traffic off the crossing and to stop other traffic.

These annunciators should be large enough to serve as a warning to pedestrians and vehicles, as well as an aid to the watchman. The majority of pedestrians and drivers who use these crossings to any extent, are convinced that they are for their safety and obey them without causing unnecessary trouble to the watchman.

They are also quite an advantage at crossings where the protection is limited to 12 or 16 hours a day. Where there are a great many gatemen in cities and streets, crossing 600 to 800 ft. apart, the annunciators, if used on all of the crossings, might become misleading, so that it would be better to have the annunciators at the crossing at each end of the town. Annunciators are also a good thing for third "trick" watchmen to be sure they do not go to sleep when there is not much activity after midnight.

Flat Particles in Concrete

What is the effect on the workability of concrete resulting from the presence of flat particles in the coarse aggregate and how should it be overcome?

They Render It Less Workable

By J. B. Watson

Assistant Engineer, Pennsylvania, Pittsburgh, Pa.

In general, any change in aggregate from a spherical shape tends to make concrete less workable, assuming that the same quantities of water, cement, sand and aggregate are used. Workability is the property of concrete which may be thought of as flowability or the quality that makes puddling possible so as to form a homogeneous mass, to avoid honeycombing or bridging. Naturally the spherical particles are more easily moved because of their rounded shapes, while particles with flat surfaces have an opposite tendency in some ratio to their flat surfaces.

The lack of workability can be overcome by decreasing the volume of coarse aggregates and using the same quantities of water, cement and sand to maintain the same strengths. This decrease in volume of the loose coarse aggregate may run from 10 per cent to 40 per cent, depending on the shape and surfaces of the aggregate and their grading.

The reverse could also apply by maintaining the same proportion of coarse aggregate and increasing the quantity of water, cement and sand, it being borne in mind that the maintenance of the same ratio of the volume of water to the volume of cement is necessary to obtain the same strengths. The volume of the water in both the fine and coarse aggregates should be taken into account and considered as a part of the water in determining the so-called water-cement ratio.

A compromise between these methods would probably be more economical in most cases, that is, workability could be obtained by increasing the sand and decreasing the coarse aggregate and adjusting the water and cement to maintain the same ratio of water to cement. A study of the Abrams theory of designing concrete mixture shows that a selection of proper sizes and grading of aggregates has much to do with the economical design of properly proportioned concrete.

The following quantities of water in gallons to each sack of Portland Cement in *workable* concrete will give the corresponding strengths. As stated above, the water in the aggregates is to be considered as a part of the water content.

Water	Strengths
8.63 gal.	1,500 lb. per sq. in. in 28 days
7.48 gal.	2,000 lb. per sq. in. in 28 days
6.64 gal.	2,500 lb. per sq. in. in 28 days
5.94 gal.	3,000 lb. per sq. in. in 28 days
5.34 gal.	3,500 lb. per sq. in. in 28 days

The ratio of one gallon of water to pounds of cement in workable concrete mixtures for various strengths is as follows:

1 gal. water—10.9 lb. cement	1,500 lb. per sq. in.
1 gal. water—12.57 lb. cement	2,000 lb. per sq. in.
1 gal. water—14.15 lb. cement	2,500 lb. per sq. in.
1 gal. water—15.83 lb. cement	3,000 lb. per sq. in.
1 gal. water—17.60 lb cement	3,500 lb. per sq. in.

Smoke Jacks and Heat Loss

"To what extent should the possible loss of heat be given consideration in the selection of smoke jacks for roundhouses?

Heat Loss Is a Minor Factor

By Building Engineer

The entire trend of smoke jack development has been toward designs and sizes providing for the maximum efficiency in ventilating or, more particularly, in the removal of smoke emitted by locomotives. In earlier designs efforts were made to have jacks function as a smoke exit with a minimum loss of heat resulting from the exhaustion of air from the roundhouse in addition to smoke. This was accomplished by providing the jack with a relatively small bell at the bottom and requiring that the locomotives should be "spotted" so that the stack would come directly under the jack. Some designs provided for a telescoping lower section to permit the jack to be dropped down over the top of the locomotive stack. Some jacks also were provided with dampers with the thought that these could be closed when the jack was not in use and thus prevent heat loss.

However, the tendency is now largely away from this form of construction, the reason being that what may be termed the tight fitting jack has not usually proved practical in actual operation. Roundhouse employees cannot be depended upon to spot the locomotive accurately under the jacks. Telescopic jacks were frequently broken by the locomotives pulling out before the jack had been raised, although this objection has been overcome by the design of a swinging jack which is virtually fool-proof. Dampers proved ineffectual because they were invariably left open. Most roundhouses being built today, therefore, are being provided with smoke jacks affording a wide extension of the bell so that the hood will cover the smokestack even if the locomotive is spotted a number of

feet one way or the other from the center of the flue. Furthermore, the railways are constantly specifying larger diameters of smoke jack flues to insure that the smoke from the locomotives will be effectively removed.

Current opinions on smoke jack requirements have been summarized by the Committee on Shops and Locomotive Terminals of the American Railway Engineering Association after an exhaustive study of this subject based in part on the replies received to a questionnaire. The conclusion of the committee as presented in its report before the association's convention in March, 1925, is in part as follows:

"Smoke jacks should be of the fixed type, at least 42 in. wide, and of such length, preferably at least 12 ft., as to permit the locomotive stacks to be spotted under the hood of the jack at all of the various positions of the locomotive made necessary by the accomplishment of certain repairs. The bottom of the hood should be as low as the height of the locomotive will permit. The area of the flue opening should be at least 7 sq. ft. Smoke jacks should not have dampers."

Advance Gangs for Rail Relaying

To what extent is it practical to send a small gang ahead of a large relaying gang to loosen joints, withdraw extra spikes on curves, remove crossing plank and do other special work to avoid delay to the larger gang?

They Are Recommended

By G. G. Smart
General Roadmaster, Great Northern, St. Paul, Minn.

The practice of working a small crew ahead of a relaying gang is to be recommended on curves where the number of spikes per tie is increased, as more men are required for this work. Also, where the joints are full spiked, which requires eight spikes per joint, their removal is often quite difficult because of the spikes being neck worn. If this work, together with the taking up of crossing planks, cattle guards, etc., is done in advance, it leaves the work to be done by the relaying gang uniform and avoids changing men in the gang from one job to another.

Preliminary Work a Vital Factor

By A. C. MacKenzie
Engineer Maintenance of Way, Canadian Pacific, Montreal, Quebec

The preliminary small-gang work ahead of rail laying operations is a vital part of the whole job, as upon its proper organization and handling depends to a large extent the speed, efficiency and unit cost of the main operations which follow. Details overlooked in the preliminary work will reflect very decidedly on the main operation with consequent delay, confusion and expense. The conditions to be taken care of in the way of preliminary work vary with the location, but in general the following will apply:

Adzing: The surface condition of ties under the rail varies with rail wear and this condition depends on whether or not tie-plates have been used, whether hard wood ties are mixed with soft wood and whether the inner rails of curves have cut into the ties, under the action of slow traffic or as a result of heavy superelevation. It is best to have any heavy shoulders removed by the section forces in advance so as to even up this part of the work, as it has been found by experience that if this is not done too many men are necessary on the adzing gang in order to avoid detaining the larger gangs that follow.

Preparing Road Crossings: Road crossings are often found to be badly filled up with dirt and should be cleared out ahead of the rail gang. Any flange rails should be laid on one side at the same time, together with cattle guards.

Bolts: Where old bolts are found hard running, they should be loosened in advance at all the joints which the rail gang will be required to uncouple, so that one or two men may readily disconnect the joints without delay to the main gang.

Extra Spikes: This item depends somewhat on how the rail is to be relaid, but in any case, care should be exercised to make sure that the claw bar gangs will have the same number of spikes per rail to draw. Often it is found that double spiking of curves will hold up the claw bars and it is also found that where the number of spikes per rail varies, it becomes necessary to have too many men on this work in order to avoid delays.

Setting Up Rails in Advance: Where the traffic cannot be diverted, and more especially where the work is to be done under heavy traffic, economy is effected by setting the rails up to the ends of the ties, as a preliminary operation, directly opposite to where they are to be placed in track. This can be done by small advance gangs using Madden machines. It has been found that 16 men will set up 5 to 7 track miles in a day in this way, where rail has been carefully unloaded.

Such advance work reduces the size of relaying gangs, which are large at the best, and permits smooth, uniform and efficient handling of the work.

A Foreman's Opinion

By Walter L. Ayers
Section Foreman, Baltimore & Ohio, Seville, Ohio

It has been my experience during about 12 years' service as foreman of extra gangs both on construction and maintenance that when relaying rail all men should be kept together while actually laying rail. When closing up for trains the rail gang should be sent ahead to loosen the spikes, and tear up any crossing plank that may be in the way while the remainder of the gang is full spiking and bolting and putting the track in a finished condition each day. Nothing is gained by keeping a gang ahead for this purpose.

Dating Nails as Aids in Tie Renewals

To what extent is the use of dating nails in ties justified, as an aid to track foremen, in determining the ties to be removed?

By S. D. Cooper
Assistant Manager Treating Plants, Atchison, Topeka & Santa Fe, Topeka, Kan.

All ties when inserted should be marked with dating nails, whether treated or untreated. The psychological effect on the foremen by the use of dating nails on ties is usually underestimated. A dating nail in a cross tie means to the foreman that the tie in question is expected to give longer service than the tie not so marked, and he will do his utmost to conserve that tie. It also serves as his record of the life of all ties in his particular track, and he will exert himself

to the utmost to prolong the life of such ties, especially when he knows that the dating nails are a record and he will be checked up on the service life given by the ties on his section as compared with ties that are not marked with dating nails.

It is hard to comprehend that anybody would want to insert ties without marking them with dating nails.

Longer Life With Dating Nails

By J. R. W. Davis
Engineer Maintenance of Way, Great Northern, St. Paul, Minn.

It is the practice on the Great Northern to place a tie dating nail in every new tie, whether treated or untreated, at the time the tie is inserted in track. A square head nail is used in untreated ties and a round head nail in treated ties.

It has been our observation that longer life is obtained when these nails are used. In examining a tie, section foremen and roadmasters charged with this responsibility are influenced by its appearance and sometimes mark ties for renewals which, after they have been removed from track, show a better state of preservation than was thought to exist at the time of examination. Had the tie been marked with a dating nail it would have been seen that the tie had been in track for a shorter period than estimated, and because of this short period of service the foreman and roadmaster would decide to leave it in another year, in some cases possibly two years. This applies particularly to treated ties. The line as to whether a tie is to be left in another year must be drawn somewhere and use of dating nails assist very much in reaching a decision.

Pipe Line Trenching

What is the most economical width to dig pipe line trenches for various depths and soils?

It Will Depend on Conditions

By a Water Service Engineer

There are so many conditions to consider in digging trenches for pipe lines that it is impossible to adopt any one formula by which to govern all digging. The size of pipe being laid, the freedom under which the work can be done and the moisture in the ground, as well as the depth of digging and soil encountered are all to be considered in this connection. Another factor is the method of digging the trench, that is, whether by hand or by machine. It should also be stated that there is considerable variation in practice. Thus, it is common to find pipe line trenches ranging in width from 18 in. to 3 ft. for depths down to 5 ft.

Under these conditions the question seems to call for a statement of general principles rather than fixed formulae. It should be remembered first of all that too narrow a trench will prove expensive instead of economical, owing to the cramped quarters for work, the greater tendency of cave-ins and other factors likely to cause delay. This is a precaution to be remembered in the simplest of trenches, but is especially important where bracing is required. The temptation when starting a trench is always to cut down the width only to find out after digging a few feet down that the trench must be widened to allow further progress. It may also be stated as a general rule that where a trench is to be dug and filled quickly it can usually be made narrower than where the trench is to be left open for any length of time. Furthermore, experience indicates that a narrower trench is allowable where a trenching machine is employed than where the work is done by hand. This is especially true in case of deep trenches where a trench may usually be dug with the minimum width acceptable for a less depth. When a trenching machine is employed, moreover, and the depth of trench does not exceed 5 or 6 ft., a narrower cutting may often be allowed and the trench widened to the required amount by breaking down the bank with the aid of bars immediately ahead of the excavators of the machine.

With these general rules and conditions in mind, it may finally be stated that no trench should be less than 12 in. wide, nor does it appear necessary to give any trench not to be dug over 5 ft. deep a width of more than 3 ft., and that, only for the largest pipe. A rule often followed is to limit the width of trenches not over 5 or 6 ft. deep to a width 18 in. wider than the inside diameter of the pipe for all cases where bracing is not required. Under such conditions any additional excavation required at the pipe joints for facilitating caulking work is done by digging around the joint when placing the pipe. Usually a two foot width of trench is ample for a 6 or 8 in. water pipe in all cases where the trench is not to have a depth exceeding 5 or 6 ft., which is the customary depth in northern climates.

The Responsibility Towards Trespassers

"What are the responsibilities of maintenance officers and foremen toward trespassers on railroad property, particularly bridges, in order to protect the railroad from liability for accidents to such persons, in addition to maintaining and installing the usual warning signs?"

Trespassing Should Be Discouraged

By H. A. Adams
Assistant to General Manager, Union Pacific System, Omaha, Neb.

Property that is subject to trespassing, particularly property not fenced and bridges, should be provided with proper signs, kept well painted in conspicuous places, calling attention to the hazard.

In addition, it is the duty of the officers and foremen of maintenance of way, as well as trackwalkers patrolling property, to call to the attention of any such trespassers the dangers that are always attendant in trespassing on railroad tracks or railroad bridges and insist on the parties using the highway or sidewalks or any other avenues provided by municipalities, counties or states. Any officer or foreman of the railroad company who observes conditions of this kind should endeavor to correct them in the best possible manner and if it is necessary to resort to the law, it should be done.

There is much trespassing by school children passing through yards and up and down tracks. This trespassing should be handled vigorously by all railroad officers, foremen and employees. On this road the safety agents visit the schools and talk to the teachers and the parent-teachers associations and to the students themselves and the method is productive of splendid results. In addition to this motion pictures dealing with this subject are shown in the schools along the railroad.

Another troublesome phase of trespassing is that

of employees of industries who take short-cuts across railroad property to and from their work. Our own employees are among these offenders. While it is an easy matter to control the employees of the railroad in such instances, it is not always easy to handle the industrial workers. However, we are working vigorously along consistent lines to break up this practice by talking to the individuals and going to their place of employment and talking to the management as well. However, there is only one way to handle this problem well and that is to make it obligatory upon officers and employees of the railroad company to meet this violation of safety practice by intense campaigns of education.

As to railroad bridges I do not favor placing walks and decking of bridges in such a way as to make passing convenient, as it is an added incentive and somewhat of an invitation for trespassers to use those routes.

Tracks Easier to Maintain on Ballasted Bridges

To what extent can the added expense for ballasted decks on bridges be justified by the reduction in cost of track maintenance thereon?

Ballast Deck Greatly Simplifies Track Maintenance Problems

By I. L. Simmons
Bridge Engineer, Chicago, Rock Island & Pacific, Chicago

Unfortunately records of the expenditures for bridge maintenance are not usually kept in such a way as to make it possible to secure actual comparisons of the relative cost of maintaining the line and surface of track on ballasted and open decks, bridges and trestles. However, experience with both classes of structures demonstrates that there is a marked difference.

In the first place, ballasted track on bridges requires less maintenance than most track on ordinary roadbed. The bridge floor definitely encloses the ballast at the bottom and sides so that it cannot spread out or force its way down as in the roadbed on ordinary track. But in comparing the condition of track on the two types of bridges the difference in the cost of maintenance is entirely accounted for in the difference of facility with which the work may be done. The ballasted structure is obviously just as prone to settlement or lateral movement as the open deck structure.

The maintenance of ballasted track on a bridge is less expensive than the track on an open deck structure for several reasons. Ballasted track is maintained by the section gang which crosses the bridge daily and which can, therefore, correct any defect as quickly as it occurs and without any loss of time in traveling. The work is done the same as on the roadbed and no trouble is experienced in handling a lift or in throwing the track where it passes from the approach to the bridge. It is done entirely independent of any part of the bridge itself.

Track on an open deck bridge must be maintained by a gang of bridge carpenters. The section gang is not permitted to interfere in any way with any part of the bridge, the responsibility of the section foreman being limited to that of noting and reporting whether the condition of the track on the bridge is such that it needs attention. This means that any work necessary on the bridge, no matter how little of it there is to do, requires the bringing of a bridge gang to the site, although the gang may be at work many miles away. Thus it involves the expense of moving the gang to and from the bridge and may entail considerable delay before the condition noted by the section foreman can be corrected.

The only way in which a bridge gang can correct any ordinary variations in alignment is to respike the rails, which is not only a much more expensive operation than that of throwing the track in ballast, but is something that cannot be done very often without resulting in serious injury to the ties. Surface can be corrected only by shimming, usually between the stringers and the caps, and when the adjustment is a small one it means the use of shims so thin that their life is very short.

One of the most troublesome problems of the track maintenance arising in connection with an open deck bridge relates not to the track on the bridge itself but to that on the approaches, especially at the point where the rails pass from the last track tie to the first bridge tie. In maintaining the approaches the section foreman must get along as best he can, making the track on the approach fit the line and grade on the bridge, since he can make no change beyond the last track tie. Therefore, when any ballast raise is made or whenever a bridge gang makes any change in the line or surface on the bridge, it is necessary to have both track gangs and bridge gangs at work at the same time. This difficulty is entirely eliminated when the ballast construction extends across the bridge.

Selecting Work Train Crews

Under the agreements now in effect with the train service brotherhoods, what measures can maintenance of way officers adopt to insure the assignment of efficient crews for work trains?

Co-operation and Better Equipment Will Help

By T. H. Carroll
Supervisor of Work Equipment, Canadian National, Moncton, N. B.

The following suggestions concerning ballast trains are illustrations of the things that can be done to insure getting the maximum service from work train crews, and creating the proper appeal to the better class of train service men.

1. Where two or more trains are used for moving ballast from the pit for distribution, these trains should be given precedence over all except first class trains.

2. Sufficient and competent employees should be placed in ballast pits to insure proper attention to ballast cars, particularly the car dumping sluice locks, and the car journals. A big source of trouble and delay to work trains in ballasting service arises from hot car journals, sometimes caused by overloading of cars. To overcome this overloading the weight of material per yard of material should be obtained and given to the operator in charge of the machine loading the cars. He will then be in a position to judge accurately the tonnage that the cars should handle. In my estimation this will greatly reduce hot journals and consequently reduce work train delays. Probably a little extra oil in the journal packing for cars while in ballasting service will help to eliminate this trouble.

There is little chance of a crew delaying the movement of a train when it receives its running orders and precautions are taken to insure proper condition of train running gear. I consider it also a mistake not to supply good power for work trains, and it goes

without saying that arrangements should be made at ballast pits to provide good food and resting quarters for crews. This is one of the greatest factors in getting efficient crews.

Since the brotherhood agreements with the railroads must be honored, the highest possible efficiency from the crews requires that the equipment be kept in good running order so that it will not be necessary to hold up trains on the main line to repack or rebush car journals, or to repair door lock bars or chains of cars.

The Best Measure Is Careful Planning of Work

By J. B. Mabile

Supervisor Work Equipment, Chicago, Rock Island & Pacific, Chicago

The question implies that on all divisions on all railroads there are some exceptionally good work train crews and some that are not as good. This will be found true in getting men for special service in any department of the railroad. A study of the failure of work train crews to function properly will usually develop, however, that something else is lacking. I have frequently found that all of the desired information is not always given when ordering trains.

If the supervising officer has ordered his work train as he should, giving all parties the necessary information to enable them to have the train ready to leave on time, goes with the train for a few hours, at least, shows the conductor just how he wants things done, he will usually get results from the train that he feels he should have. If he then leaves the train to look after other work and later finds that the performance of the train was not as good after he left as it was before, his next problem is to find out why. If it develops that his train or engine crew is inefficient and he investigates the matter to a point where he can show conclusively that the crew was inefficient or inattentative, he should have no trouble in getting the crew taken off and another crew assigned. But before making such complaint he should make a very thorough investigation. From my experience the brotherhoods do not expect to keep inexperienced or inefficient men on any train.

It Depends Largely on the Track Officer

By I. H. Schram

Regional Engineer, Erie, Chicago

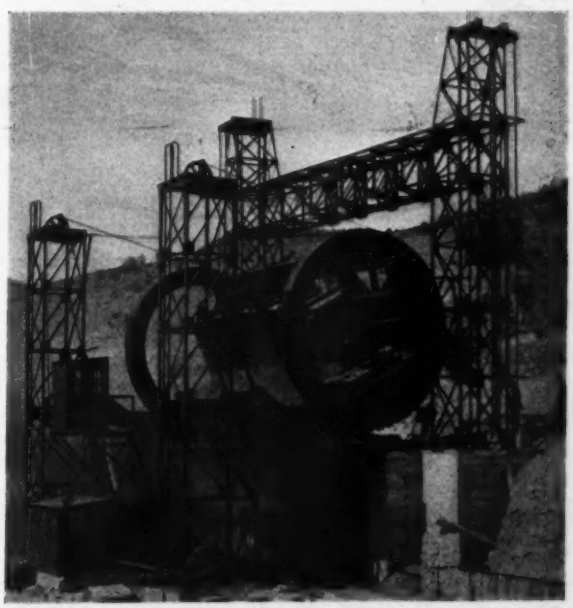
Under the schedules of the train service brotherhoods, it is generally necessary to advertise work train positions when the crew is to be engaged for any length of time and seniority is followed in assigning the crews. In some cases this system produces train crews that take an interest in their work and try to get the proper work done, and in other cases it has the opposite effect. It does have the features of permitting some knowledge of the candidates to be gained in advance and affords an opportunity for the division engineers and trainmasters to discuss the subject together.

On many divisions in past years it has been the practice and in some cases it was the unwritten rule that the superintendents could pick the work train conductors. This generally led to efficient crews. These rules are no longer in effect, but a number of conductors are in the service who were trained under such rules and made a reputation for the amount of work they could accomplish and who are still willing to serve as work train conductors, or, if incapacitated through age or other reasons, are willing to tell the younger men what they did. Where the old men themselves are willing to serve, they are almost always old enough on the roster so that they can take the positions. They give excellent service, take a pride in doing more than the other fellow and are employees of the most loyal kind.

Some times it is found that none of the older men desire a work train because of the place of the tie-up or some other reason and a younger conductor may then bid for the work. It then devolves upon the division engineer and supervisor to work with this man and spur him to increased efforts, generally by lending him the assistance that can be given through good cabooses, the co-operation of carmen in keeping equipment in shape, and the assistance of the dispatchers in giving correct and timely information in regard to train movements. A conductor, who may have been regarded as none too strong on work train service, may become a capable officer in this way.

Keeping comparative records on each supervisor's territory of the work done by units which are in the hands of work train crews, such as steam ditchers and Jordan spreaders, also has an excellent effect, as there are few conductors who will not strive to help the supervisors on whose territory they are assigned. Of course it is just as necessary to have efficient maintenance forces connected with the work train whose work is programmed carefully in advance as the best conductor cannot overcome poor planning on the part of the supervisor. If the latter does his part, however, good results are generally forthcoming.

There are extreme cases which indicate an unwillingness to do what is required. Such cases again require the co-operation of the division engineer and the trainmaster. Proper investigation develops readily where real effort was not made, and where necessary disciplinary action should be taken as it can be taken under the schedules. Such action is not often necessary, however, and the disqualification of a conductor for work train service is rare, more because such action is unnecessary than because proper investigations are not made.



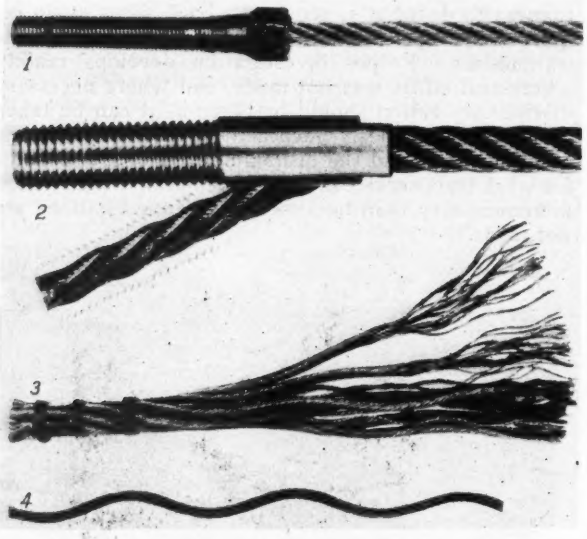
Denver & Rio Grande Western Car Dumper at Salida, Colo.

New and Improved Devices

A Basic Change in Making Wire Rope

A BASIC change in wire rope construction is embodied in a new rope, now manufactured by the American Cable Company under the trade name of Tru-lay. The new principle developed in the making of the rope is the "preforming" of wires and strands to the exact shape they must have to fit correctly in the completed product. The rope is being made in lang and regular lays up to one inch in diameter.

An important characteristic of the Tru-lay rope is that it resists unstranding. It can be cut at any point for splicing and be otherwise handled without the necessity of seizing. Exhaustive tests are said to show that it has considerably longer life than ordinary rope under reversed bending stresses—an important asset where winding over sheaves and drums is a chief cause of wear. The preforming of the wires and strands in



(1) The Hexagon Tru-Loc Fitting. (2) Fitting Split Open to Show How the Metal Grips the Rope. (3) How an Ordinary Wire Rope Unstrands When Cut. (4) A Strand of Tru-lay Wire. Preformed to Hold the Exact Shape it Must Take in the Completed Rope

the rope results in more evenly balancing the load on individual strands as well as on the single wires. The rope shows no tendency to high strand in actual use and has stood up satisfactorily in winding tests under heavy loads.

Broken wires in this new rope are said to lie flat. Outer wires on cables, broken by long wear or abrasion, cause considerable trouble and often necessitate the removal of the rope before it should be discarded. The outer wires of the Tru-lay rope show no tendency to fray out of the rope body. They continue in their places, thus lessening the wear on other wires and on sheaves and drums. The fact that the rope does not unstrand makes splicing a more simple operation.

Rope users have long known that lang-lay rope has advantages over regular lay for certain sheave and drum work. While 80 per cent of the mine cable used in England and Europe is lang lay, it has been little

How Tru-lay Rope Can Be Cut and Handled Without Seizing and Without Loss of Shape

used in the United States because of difficulties in splicing and handling. The preformed principle in Tru-lay rope is designed to meet this difficulty, making the use of lang lay rope possible wherever desired.

To make available practically the entire strength of the new rope, the American Cable Company has developed a special steel fitting, without zinc, called Tru-loc. The True-loc fitting has not only proved dependable under ordinary conditions but also permits the use of turnbuckles, shackles and other equipment used heretofore only with rods and chains. A steel sleeve is slipped over the smooth unseized end of the rope, placed in a specially designed press, and made to "flow" down upon the rope until it grips wires and strands. These sleeves may be of any reasonable length—can be threaded, can be equipped with heads of various types for wrenches, or furnished with eyes or hooks. The fitting is lighter, less bulky and is said to be more dependable than the old-style zinc socket, probably because of the greater equalization of the load on wires and strands.

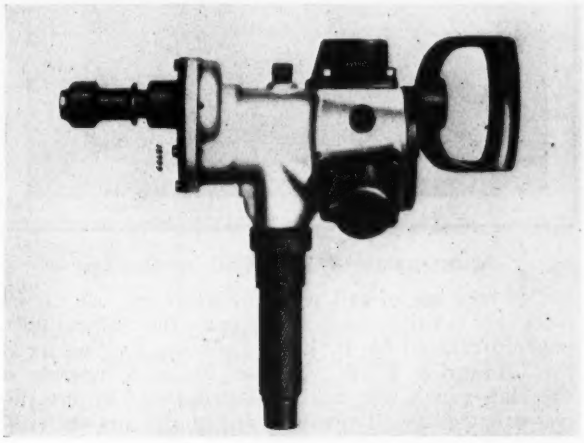
A Pneumatic Drill for Wood Boring

A NEW SIZE, light weight, reversible, pneumatic wood boring machine has been brought out by the Ingersoll-Rand Company, New York, which is known as Size DD and is suitable for drilling holes up to one inch in diameter. The construction of this machine is similar to that of the other three-cylinder drills which this company manufactures. The features of this type of machine are briefly a special three-cylinder motor; a light-weight aluminum case with steel bushings cast in place in all the bearing holes and the throttle hole; a renewable crank pin sleeve; and cast iron cylinders which are renewable and interchangeable.

The renewable cylinders are a valuable feature, as any cylinder after long service may easily be replaced at slight cost. Every part is readily accessible for inspection. The drill is said to show high economy

in air consumption and cost of maintenance.

The details of the Size DD drill are as follows: The average working speed is 705 r.p.m.; the weight including grip handle and chuck is 15 lb.; the length of feed (with feed screw), is 2½ in., and the length overall (with grip handle) is 15 in. With a width from



The Size DD Pneumatic Drill

side to center of spindle of only 1 9/16 in. it is capable of use in close quarters. The size of hose recommended is ½ in.

These drills are furnished with a spade handle and bit chuck as standard. A breast plate or feed screw can be substituted in place of the grip handle and a drill chuck in place of the bit chuck, when so desired.

Tool Grinder Has Useful Attachments

A TOOL grinder with an unusually complete set of tool holding accessories is being introduced in the railway field by the Carborundum Company, Niagara Falls, N. Y. It is especially designed for field service, being fitted with malleable iron clamps for mounting it on the platform of a section car. The wheel, which

The Niagara 33 Tool Grinder

is made of an abrasive known as aloxide, is 8 in. by 1½ in. and the end of the shaft is designed to receive in addition a 3¼-in. by 5-in. cone made of the same abrasive. The attachments are arranged for the holding of tools ordinarily employed in track or bridge and building work such as twist drills, chisels, adzes, scythes, etc., and in addition a dresser is furnished for the purpose of redressing or truing the surface of the wheels. These attachments are designed for the holding of tools of a wide range of sizes and those provided for handling drill bits are equipped with a ratchet feed dial designed to give an adjustment within six one-thousandths of an inch. The truing attachment is equipped with spur cutters of glass-hard steel and has a screw feed which enables the operator to dress the wheels quickly and accurately. The grinder designed for maintenance of way service is known as the Niagara 33.

A Further Development in Grade Crossing Protection

ANOTHER variation of the speed-retarding type of grade crossing protection has recently been applied at the crossing of a state highway and the Atlanta & St. Andrew's Bay railroad at Cottondale, Fla. This provides for the introduction of a sharp reverse curve in the approach lane of the highway between a concrete curb and a strong woven wire fence.

As seen in the photograph the concrete curb is built on the center line of the highway for a distance of 70 ft. each way from the ends of the track ties. A second curb is constructed on the arc of a circle so as to form a parkway, having the form of a circular segment 50 ft. long by 10 ft. wide. The outer side of the curved drive-

The Sharp Curves Compel the Motorist to Reduce Speed

way thus formed is enclosed by a Page "hi-way" guard or fence supported by heavy posts, this construction being sufficiently strong to stop a car traveling at such a speed that it cannot follow the curve of the highway.

A sign designating the railroad crossing is placed in the parkways at their outer ends, supplemented by a red reflector. This plan was developed by the Florida State Road department.

A Smokeless Asphalt Kettle

A SMOKELESS tar, pitch and asphalt kettle for roofing, waterproofing, insulating, flooring and paving work has been developed by the Aeroil Burner Company, Inc., Union Hill, N. J. As seen in the illustration this consists of an outside heater kettle with an opening at the bottom of one end into which the blast from a heater torch is directed, this torch being fed with fuel under pressure from an oil reservoir.

The outer kettle is designed to receive an inner kettle containing the material to be heated. This container has two compartments; a dividing screen separates the cold material from the hot molten material and also prevents clogging of the draw-off cock. It is said that the burner will produce molten material within 10 min. after lighting the oil burner. Because

of this method of heating, there is no waiting to kindle a fire and it is possible to control the temperature accurately. This prevents coking, eliminated ashes, smoke and sparks, and makes it possible to take the outfit indoors or on a roof instead of hoisting molten material to the job with its attending inefficiency and hazard.

The kettle is compact and when not in use the inside kettle can be lifted out and the burner stored inside, thus saving considerable space in moving from job to job. The kettle is of durable construction, having all the seams welded.

The Aeroil Asphalt Kettle

It is said that this kettle melts pitch at an average fuel cost of 50 cents per ton, or high melting point asphalt at $1 a ton, and in much less time than with a wood fire. The burner which is supplied with this kettle can also be used for melting ice and snow on roofs, drying out wet roofs and similar heating and thawing purposes. The kettle is made in 50, 75 and 100-gal. sizes and is constructed either with legs or mounted on wheels, as desired.

In the West Coast Forests

With the Associations

Maintenance of Way Club of Chicago

The relaying of rail with the exclusive use of one track on multiple track lines was the subject of a paper presented by P. J. McAndrews, roadmaster of the Chicago & North Western, before a meeting of the club which was held on April 14. The meeting was attended by 50 members and guests and the reading of the paper was followed by active discussion.

American Railway Engineering Association

As a result of the promptness with which the Committees on Subjects and on Personnel of Committees of the Board of Direction completed their assignments, as outlined in the April issue, seven of the standing committees of the association held meetings during April to organize their work and undertake their investigations. This is an earlier start than has ever been made by the association in any preceding year.

Roadmasters' Association

A meeting of the Executive Committee and the chairmen of committees will be held at the Baltimore Hotel, Kansas City, Mo., on June 27. At this meeting the program for the convention will be formulated and the reports of the committees will be presented in tentative shape.

The convention and exhibit will be held in the Municipal Auditorium, where adequate space will be available for the exhibits immediately adjacent to the convention hall. This hall is centrally located close to the leading hotels.

Wood-Preservers' Association

The Forest Products Laboratory of Canada has invited the officers of the Wood-Preservers' Association to hold their next meeting at the laboratory at Montreal in order that the laboratory staff may benefit from the discussion of the problems involved in the treatment of Canadian woods. A meeting of the Executive Committee of the Wood-Preservers' Association and the chairmen of committees has, therefore, been called at Montreal on July 8-9.

The association is in the midst of an aggressive campaign for members, as a result of which more than 40 applications have been received since the convention last February.

The following chairmen have been appointed to direct the work of committees during the ensuing year:

Service Bureau Board: R. S. Manley, Texas Creosoting Company, Orange, Tex.

Retailing Treated Forest Products: George E. Rex, National Lumber & Creosoting Company, Kansas City, Mo.

Preservatives: L. C. Drefahl, Grasselli Chemical Company, Cleveland, Ohio.

The Treatment of Ties: W. E. Jackson, Santa Fe Tie & Lumber Preserving Company, Somerville, Tex.
The Treatment of Fir Ties: M. M. Rabourn, Union Pacific, Laramie, Wyo.
The Treatment of Car Lumber: C. M. Taylor, Port Reading Creosoting Plant, Port Reading, N. J.
The Treatment of Fir Lumber: H. E. Horrocks, Pacific Creosoting Company, Seattle, Wash.
The Treatment of Piling: H. E. Horrocks.
The Non-Pressure Treatment of Poles: J. D. Burnes, Page & Hill Company, St. Paul, Minn.
Inspection: F. C. Krell, Pennsylvania System, Philadelphia, Pa.
Plant Operation—Material Handling: J. R. Helson, Joyce-Watkins Company, Metropolis, Ill.
Tie Service Records: Z. M. Briggs, Pennsylvania System, Pittsburgh, Pa.
Paving Blocks: L. T. Ericson, Jennison-Wright Company, Toledo, Ohio.
Service Records of Posts: Wm. Steen, Long-Bell Lumber Company, Shreveport, La.
Steam Treatments: George M. Hunt, Forest Products Laboratory, Madison, Wis.

Directory of Associations

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, Buffalo, N. Y., October 20-22, 1925.

AMERICAN RAILWAY ENGINEERING ASSOCIATION (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Annual convention, Congress Hotel, Chicago.

AMERICAN WOOD PRESERVERS' ASSOCIATION—E. J. Stocking, secretary, Room 1146 Otis Bldg., Chicago. Next convention January, 1926, Cleveland, Ohio.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—B. J. Wilson, Pocket List of Railroad Officials, 605 Fisher Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention January, 1926, Hot Springs, Ark.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly secretary, Seeberger Building, 825 South Wabash avenue, Chicago. Annual exhibition at convention of American Railway Engineering Association.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—T. F. Donahoe, secretary, B. & O., Pittsburgh, Pa. Next convention September 22-24, 1925, Kansas City, Mo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

Old Stone Abutment on Abandoned Sante Fe Location Near Bazar, Kan.

The Material Market

AFTER operating at a rate of production during the first three months of 1925 which, if it were continued through the year on the same basis, would have represented a greater output than in any year in history, the manufacturers of iron and steel are now definitely curtailing their output. During the month of April the average rate of production was estimated at approximately 75 per cent of capacity. Orders for new track materials are limited but there is continued activity in specifying against old orders. As for some time in the past, prices have not been subject to appreciable change although they manifest decided weakness. Current prices for iron and steel products used in the maintenance and construction of railroads are given below:

PRICES PER 100 LB.

	March		April	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.90 to $3.20	$3.00	$2.80 to $3.10	$3.00
Track bolts	3.90 to 4.25	4.00	3.90 to 4.25	4.00
Angle bars	..... 2.75	2.75	..... 2.75	2.75
Tie plates, steel	2.35 to 2.50	2.45	2.35 to 2.50	2.35
Boat spikes	..... 3.25	3.25	..... 3.25	3.25
Plain wire	2.60 to 2.70	2.70 to 2.80	2.50 to 2.60	2.70
Wire nails	2.85 to 2.95	2.95 to 3.05	2.75 to 2.85	2.95
Barb wire, galv.	3.55 to 3.65	3.65 to 3.75	..... 3.55	3.65
C. I. pipe, 6 in. to 12 in., ton	....	47.20	....	46.70
Plates	2.00 to 2.10	2.30	2.00 to 2.10	2.20
Shapes	..... 2.10	2.30	..... 2.10	2.20
Bars, soft steel	..... 2.10	2.20	..... 2.10	2.10 to 2.20
Rivets, struct.	..... 2.60	2.75	..... 2.60	2.75
Conc. bars, billet	..... 2.10	.....	..... 2.10	.....
Conc. bars, rail	.....	2.10	....	2.10
Rail, per gross ton, f. o. b. mills	....	43.00	....	43.00

The scrap market is still inactive and prices have suffered further reductions during the month. Quotations current during the month of April as given below are fully 20 per cent lower than those in December, 1924.

PRICES PER GROSS TON AT CHICAGO

	March	April
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	18.00 to 18.50	16.00 to 16.50
Rails less than 3 ft. long	19.00 to 19.50	17.50 to 18.00
Frogs and switches cut apart	17.00 to 17.50	15.25 to 15.75
Steel angle bars	18.00 to 18.50	16.50 to 17.00

Business in the lumber market is limited and every effort is being made by the manufacturers to keep production proportionate to demands. Conditions in the market are definitely reflected in the current prices of Southern Pine items given below which are generally lower than those of the month preceding but this is not apparent in available quotations on west coast lumber. However, it is well to bear in mind that in a weak market quoted prices by no means represent the minimum.

SOUTHERN PINE MILL PRICES

	March	April
Flooring, 1x4, B and B flat	$48.85	$46.16
Boards, 1x8, No. 1	38.70	36.06
Dimension, 2x 4, 16, No. 1, common	29.56	28.74
Dimension, 2x10, 16, No. 1, common	30.37	29.61
Timbers, 4x4 to 8x8, No. 1	29.38	29.18
Timbers, 3x12 to 12x12, rough	38.49	.....

DOUGLAS FIR MILL PRICES

	March	April
Flooring, 1x4, No. 2, clear flat	$35.00	$35.00
Boards, 1x8, 6 to 20, No. 1, common	$18.50	18.50
Dimension, 2x 4, 16, No. 1, common	19.50	19.50
Dimension, 2x10, 16, No. 1, common	19.00	19.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, rough	18.00	18.00

Prices for Portland cement which are given below in terms of the price per barrel in carload lots not including package are the same as those given last month with the exception of that for San Francisco, which is 30 cents lower than that previously shown.

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2.19	Dallas	2.05
New Orleans	2.40	Denver	2.84
Chicago	2.20	San Francisco	2.31
Cincinnati	2.47	Montreal	1.80

News of the Month

It is reported that President Calles of Mexico will return the National Railways of Mexico to their private owners about July 1.

Thomas F. Woodlock became a commissioner on the Interstate Commerce Commission on April 1, under a recess appointment by President Coolidge, pending the next session of the senate.

Fifteen miles of the electrification work in contemplation on the Virginian has been completed and is expected to be placed in operation during the summer, the first of the locomotives reaching the road about June 1.

The Southern Pacific of Mexico plans to open the first 85 miles of its extension into Mexico by July 1, this portion of the line extending from La Quemada, Jalisco, to Amatitan. The remainder of the line, comprising 30 miles to Orendain, will not be completed until some time next year, on account of the heavy construction involved.

A recent development in the application of automatic train control to railroads, under orders of the Interstate Commerce Commission, is a suit brought by the Delaware & Hudson petitioning for an injunction against the order of the Interstate Commerce Commission on the theory, principally, that the action of the government in forcing the railroads to adopt automatic train control is unconstitutional.

In January the Class I roads consumed 9,209,561 tons of coal at an average cost of $2.82 a ton, as compared with 9,436,027 tons of coal in January, 1924, when the average cost per ton was $3.23. These roads also consumed 185,665,593 gal. of fuel oil, costing on the average 2.87 cents per gal., as against 188,924,775 gal. of fuel oil consumed in January, 1924, when the average cost was 2.46 cents per gal.

A reduction from 66 to 4 recognized types and sizes of vitrified paving brick, is the record of the paving brick industry in the direction of simplified standards during the last four years, as carried out with the co-operation of the of the United States Department of Commerce. Of the total shipments during 1924, 82.1 per cent were in the four types and sizes now recognized by the Permanent Committee on Standards.

A 24 page pamphlet, 4½ in. by 7½ in., dealing with the highway crossing situation, has been prepared by the Safety section of the American Railway Association, for general circulation. This booklet has been compiled for circulation by individual railroads, for which purpose space is left on the front cover for the name of the issuing railroad. It is expected that the booklet will contribute substantially to this year's highway crossing campaign, beginning June 1.

Nearly 28 per cent of all the income producing endowments of the principal colleges, universities and technical schools of the United States are invested in steam railroad stocks and bonds, as shown by a questionaire sent to 65 of the foremost endowed colleges and other educational institutions by the Bureau of Railways Economics. The total book value of the investment of these 65 institutions amount to $531,696,685, of which $140,270,933 comprises investments in steam railroads.

During the last 20 years derailments caused a property loss to the railroads of $171,943,014, which is equivalent to $8,587,150 per year, or $716,430 per month. During the same period collisions caused a property loss of $173,717,858, which is equivalent to $8,685,393 per year, or $723,781 per month. During the last 25 years the records show that 218,830 persons were killed and 3,308,935 other persons injured on railroads from all causes, or an average of one person killed every hour and one injured every 3 min. 57 sec. Of the total fatalities, 75,684 involved employees, while 2,809,592 employees were injured.

During the month the Norfolk & Western placed in operation at Prichard, W. Va., a coaling station which is built entirely of cast-in-place reinforced concrete from the foundation to the peak of the roof. The station is 135 ft. high above base of rail of the coaling tracks, has a circular reinforced concrete bin 55 ft. in diam., with a storage capacity of 2,000 tons of bituminous coal and is arranged to deliver coal simultaneously to locomotives on six tracks.

Maintenance of way expenditures for the month of February, 1924, the last month of record, are reported by the Interstate Commerce Commission as having totaled $54,923,943, or an increase of $504,000 over the same month in 1924. During this month operating expenses totaled $355,554,750, or a reduction of 5.2 per cent from the operating expenses of February, 1924, while the net operating income was $64.910,210, or a decrease of $6,695,350 as compared with the same month in 1924.

The Railroad Insurance Association, 80 Maiden Lane, New York City, has issued a statement which shows that of $2,673,230 paid for damages from a total of 1,764 fires during 1924, $617,560 represents losses from fires caused by sparks; $306,664 from pronounced carelessness; $261,320 from electrical causes; $17,679 from heating; $20,426 from lighting; $41,254 from oil paints, etc., and $542,337 from unknown causes. Sparks or flames from acetylene torches caused 27 fires, the damage aggregating $252,689, while careless smokers caused 78 fires, with a loss of $226,899, with cigarettes causing 11 fires and an aggregate loss of $37,621.

The preliminary accident report of the Interstate Commerce Commission, covering railroad accidents in the United States during the year 1924, shows that only 41 passengers were killed in train accidents during the year, while the total number of persons of all classes killed in such accidents was 367, which is a substantial decrease from the number of fatalities reported for the preceding year. The total number of persons killed at highway grade crossings in 1924 was 2,149, as compared with 2,268 in 1923, while the number of persons injured was 6,525, as compared with 6,314 in 1923. The total number of persons killed from all accidents in 1924 was was 6,617, as compared with 7,385 in 1923, while the total number of persons injured was 143,739, as compared with 171,712 in 1923.

Statistics compiled with reference to the value of college education in railway service show that 36.3 per cent of the railroad presidents represented on the executive committee of the Association of Railroad Executives, which operate about 160,000 miles of road, 35 per cent of the higher operating officers of these roads, 13 per cent of the high traffic officers, 87 per cent of the higher law officers and 21 per cent of the heads of the accounting department of these railroads, had attended college three or more years. This information has since been supplemented with figures showing that 79 per cent of the chief engineers, and about 59 per cent of the chief mechanical officers of the roads are college men, while a total of 118 of the 255 higher railway officers of these roads, 47 per cent, have had college educations.

Labor News

Demotion of Carpenter Foreman Not Covered By Agreement

A carpenter foreman on the New York, New Haven & Hartford, after three years service as carpenter and 10 years as carpenter foreman took his first vacation. When he returned he was advised that he had been demoted and his position assigned to another man, his junior in the service. The explanation offered was that his successor, while employed in his place during the vacation, had demonstrated greater ability as a foreman in that his time books showed a better labor production. Later he was reinstated as foreman but after three months he was again demoted, the same reasons being assigned by his superiors. Objections to this action by the railroad were raised by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, who contended that it constituted a discrimination and violation of seniority rights and after unsatisfactory hearings with the railroad, the case was taken before the labor board.

The carrier's position was that the agreement with the brotherhood nowise covered foremen and contained no provision relating to the working conditions of the foremen. The decision of the board was that in the absence of any rule in the existing agreement governing the case in question the claim of the employees was denied.—Decision No. 3116.

Irregular Hours of Employment Justified by Emergency Conditions

In order to carry out the maintenance and repair of the tunnel at the west approach of the Eads bridge, as quickly as possible and with the least interference with traffic, the Terminal Railroad Association of St. Louis organized some of the regular tracks and bridge and building gangs into three eight-hour shifts. Accordingly some of the gangs were ordered to report for work at 3:30 P. M. and others at 11:30 P. M., whereas the regular time for starting work was 7 A. M. This was objected to by some of the men, the position of the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers being that the railroad should not have introduced these changes in the hours of employment without consulting the representatives of the employees, in accordance with the rule governing the hour of the starting time of the working period. A demand was also made for overtime for all hours employed outside of the regular working period. The contention of the carrier was that the work was of an emergency nature, that the two tracks in the tunnel constitute two of the busiest thoroughfares on the system and that the repair work must be done at times when it will result in the least detention of traffic. This led to the plan of dividing the forces into three shifts covering the 24-hour period. The decision of the board was that evidence did not indicate the violation of any rules of the agreement by the carrier and that the employees are entitled to overtime rate only for such service as is in excess of eight hours in any 24-hour period, but that they must be reimbursed for any time which they may have lost in consequence of a change from one shift to another.—Decision No. 3121.

The New York Central, which has been operating a motor truck service between Buffalo, N. Y., and Cleveland, Ohio, for one year, has extended the handling of l. c. l. freight by motor truck from Cleveland to Toledo. This service will replace the usual division local way freight trains insofar as the handling of l. c. l. freight is concerned except where the tonnage warrants loading in freight cars to points of destination. The general plan provides for the handling of l. c. l. freight from and to railroad freight houses and stations on the division by means of motor trucks operating over the highways. These trucks are operated on regular daily schedule, except Sunday, starting from the main division terminal with a view to providing early first morning delivery at railroad freight stations of freight originating at main distributing points.

Personal Mention

General

Julius Kruttschnitt, chairman of the executive committee, and of the board of directors of the Southern Pacific, and an engineer by education and early training has announced his intention to retire on May 31, under the pension rules of the company, after having served continuously with the Southern Pacific lines for 48 years. Mr. Kruttschnitt was born on July 30, 1854, at New Orleans, La., and studied civil engineering at Washington and Lee University, Lexington, Va., from which he graduated in 1873. He entered railway service in 1878 as resident engineer in charge of construction work on the Morgan's Louisiana & Texas Railroad and Steamship Company, now a part of the Southern Pacific. On the completion of this work on January 1, 1880, he was appointed roadmaster of the Western division, and continued in this capacity until April 1, 1881, when he was promoted to assistant chief engineer. He was promoted chief engineer on April 1, 1883, and relinquished this position on October 1, 1885, to become assistant general manager of the Atlantic system of the Southern Pacific. Thenceforth he was engaged consecutively in various operating positions and was vice-president of the system in April, 1904, when he became director of maintenance and operation of the Union Pacific, the Oregon Short Line, the Oregon-Washington Railroad & Navigation Company, and of the Southern Pacific Company. In 1913, upon the separation of the Southern Pacific and Union Pacific, he became chairman of the Executive committee of the Board of directors of the Southern Pacific and its many subsidiaries.

Julius Kruttschnitt

W. R. Armstrong, assistant chief engineer of the Oregon Short Line, with headquarters at Salt City, Utah, has been promoted to general superintendent of the Los Angeles & Salt Lake, with headquarters at Los Angeles, succeeding **N. A. Williams,** transferred.

Mr. Armstrong was born in August, 1869, at Kansas City, Kan., and was educated at the University of Kansas. He entered railway service in May, 1889, as an axman on construction work and from May, 1892, to March 1895, served on the Kansas City Southern in various engineering capacities, including that of division engineer. He was promoted to superintendent of construction in March 1895, and from January 1, 1898, to December, 1899, was superintendent of the Kansas City & Northern connecting railroad, following which he served as a roadmaster on this road and on the Omaha, Kansas City & Eastern until March 1, 1900, when he became locating engineer on the Kansas City, Mexico & Orient. He entered the service of the Oregon Short Line on November 26, 1905, as an assistant engineer in charge of construction work and on October 30, 1908, became acting superintendent of the Northern division, following which he served as assistant superintendent and as division superintendent, until April, 1923, when he was appointed general manager and chief engineer of the Salt Lake & Utah. He was appointed engineer of maintenance of way of the Union Pacific on August 1, 1916, and in May, 1919, he was made assistant chief engineer of the Oregon Short Line unit, which position he held at the time of his recent promotion to general superintendent.

Engineering

C. A. Knowles has been appointed valuation engineer of the Chesapeake & Ohio, with headquarters at Richmond, Va., succeeding **R. B. Burks,** deceased.

George B. Farlow, assistant engineer of the Pittsburgh division of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., has been promoted to division engineer of the Charleston division, with headquarters at Weston, W. Va., succeeding **J. L. Maher,** who has been transferred to the Monongah division, with headquarters at Grafton, W. Va.

H. L. Bell, assistant division engineer on the Southern Pacific, Texas lines, with headquarters at Houston, Tex., has been promoted to division engineer, with the same headquarters, to succeed **J. H. Knowles,** who has been appointed division engineer of the El Paso division, with headquarters at El Paso, Tex., following the death of **J. W. Harshaw.**

L. W. Althof has been appointed division engineer of the Idaho division of the Oregon Short Line, with headquarters at Pocatello, Idaho, succeeding **F. D. Nauman,** who has been promoted to engineer maintenance of way with the same headquarters, in place of **B. H. Prater,** who has been promoted to assistant chief engineer, with headquarters at Salt Lake City, Utah, succeeding **W. R. Armstrong,** promoted as noted elsewhere in these columns.

Leonard L. Sparrow, principal assistant engineer of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed engineer of statistics, with the same headquarters. He has been succeeded as principal assistant engineer **by P. R. Boese.** Mr. Sparrow was born on November 17, 1872, at Philadelphia, Pa., and was educated at the University of Tennessee. He entered railway service in 1895, as a rodman in the maintenance of way department of the Baltimore & Ohio. which position he held until 1899, when he became resident engineer of that road, at the Thomas tunnel between Pittsburgh and Wheeling. In 1901, he became assistant engineer in charge of preliminary surveys, and in 1902, was made resident engineer on important grade reduction and double tracking on the Connellsville division, and also on the construction of low grade line and the Bentford tunnel. From May, 1904, to August, 1907, he was in charge of construction of the terminals on the Atlantic Coast Line, at Jacksonville, Fla., and from August, 1907, to May, 1908, was engineer of roadway on the First division of the same road. In May, 1908, he became engineer of roadway on the Third division, which position he held until September, 1917, when he was appointed office engineer in the chief engineer's office, at Wilmington, N. C. In September, 1919, he became principal assistant engineer on this road, which position he held until his recent appointment as engineer of statistics.

Leonard L. Sparrow

M. E. Thomas, division engineer of the Iowa division of the Chicago & North Western, with headquarters at Boone, Iowa, has been given jurisdiction also over the Iowa and Minnesota division, the engineering offices of the Iowa and Minnesota division and the Iowa division having been consolidated. **J. A. Dyer,** division engineer of the Iowa and Minnesota division has been transferred to the Southern Illinois and South Pekin division, with headquarters at South Pekin, Ill., succeeding**H. G. Lennox,** transferred. **E. L. Mead,** division engineer of the Wyoming division, with headquarters at Casper, Wyo., has been transferred to Chadron, Nebr., with jurisdiction over both the Wyoming division and the Black Hills division, the engineering offices of these having been consolidated. **D. K. Van Ingen,** division engineer of the Black Hills division, has been assigned to other duties. **H. M. Spahr,** division engineer of the Northern Wisconsin division, with headquarters at Green Bay, Wis., has been given jurisdiction also over the Lake Shore division, the engineering offices of these having been consolidated. **W. T. Main,** division engineer of the Lake Shore division, has been granted leave of absence.

C. R. Adsit, maintenance inspector in the office of the chief engineer of maintenance, of the Baltimore & Ohio, Lines West, with headquarters at Cincinnati, Ohio, has been appointed assistant division engineer at Akron, Ohio, to succeed **R. W. Gilmore,** who has been appointed first assistant in charge of the engineering corps at Akron, relieving **J. B. Lord,** who has been transferred to Dayton, Ohio, upon the resignation of **L. E. Martin.**

Track

C. O. Davis has been promoted to roadmaster of the Duran district of the Southern Pacific, Pacific system, with headquarters at Duran, N. Mex., to succeed **J. A. Rutledge.**

Timothy Ryan has been promoted to supervisor of track on the New York Central, Lines West, with headquarters at Franklin, Pa., to succeed **J. E. O'Connell,** who has been transferred to Toledo, Ohio in place of **J. A. Prentice,** who has been promoted to general inspector, with the same headquarters.

Albert LeGault, engineer inspector on the Canadian Pacific has been promoted to roadmaster on the St. Guillaume, Stanbridge and Drummondville sub-divisions with headquarters at Farnham, Que., succeeding **J. Gagne** who has been transferred to the Newport and Oxford sub-division with the same headquarters. Mr. Gagne succeeds **C. A. Owens** who has been transferred to Sudbury, Ont., to succeed **William Kelly** retired on pension.

John A. Gude has been promoted to roadmaster on the Southern Pacific, Texas lines, with headquarters at Ennis, Tex., to succeed **C. W. Cobb,** deceased, and **R. R. Blankenship** has been promoted to roadmaster on the Lufkin district, with headquarters at Lufkin, Tex., following the resignation of **T. A. Palmer.** Mr. Blankenship, was born on September 12, 1881, at Corinth, Miss., and entered railway service in July, 1898, as an assistant foreman of bridges and buildings on the Illinois Central, where he served consecutively as assistant foreman of bridges and buildings, as extra gang foreman and section foreman until November, 1901, when he left railway service for a period of three years. From 1904 to 1906 he served as section foreman on the Mobile & Ohio and from 1906 to 1913 as extra gang foreman on the International-Great Northern. He entered the service of the Southern Pacific as an extra gang foreman in 1919 and was serving in this capacity at the time of his recent promotion to roadmaster.

S. Williamson, whose promotion to roadmaster on the Louisville & Nashville, with headquarters at Birmingham, Ala., was reported in the March issue, entered railway service for the first time in 1906 as a chainman on locating party on the Southern, following which he attended the engineering school of the University of Tennessee until his graduation in 1910, when, after serving as a rodman on dock construction during the summer, he entered the employ of the Louisville & Nashville as a draftsman in the construction department. He served as a draftsman until 1913, when he was appointed masonry inspector, thereafter being employed consecutively as masonry inspector, instrument man and assistant engineer in the construction department until 1914, when he entered the maintenance department. He was engaged as an instrumentman on maintenance until 1914, when he was appointed a draftsman in the chief engineer's office. From 1916 to 1923 he was employed as assistant engineer on the Kentucky division and Cincinnati terminals, and on the latter date was promoted to supervisor of construction on second track,

where he remained until his recent appointment to roadmaster.

G. C. McCorkle has been promoted to general foreman of track on the Lake Erie & Western district of the New York, Chicago & St. Louis, with headquarters at Muncie, Ind., to succeed **J. A. Gard**, who has been promoted to roadmaster, with headquarters at Bloomington, Ill., following the retirement of **J. F. Shanahan**. Also effective on April 1, the jurisdiction of **William Rotroff**, general roadmaster of the Lake Erie & Western district has been extended to include the Nickel Plate district, with headquarters at Lima, Ohio.

Roland T. Huson, whose promotion to roadmaster on the Kansas City Southern, with headquarters at Shreveport, La., was reported in the April issue, was born on October 11, 1888, at Mansfield, La., and entered railway service in April, 1907, as a chainman on this road. After serving consecutively as chainman, rodman and transitman until April, 1911, he left railway service temporarily but re-entered the service of the Kansas City Southern in September, 1911, and from this time until September, 1912, served as station agent and cashier. He was subsequently a rodman on engineering work and again station cashier on the Kansas City Southern until January, 1914, when he left railway service. Re-entering the service of the Kansas City Southern in January, 1918, he was engaged consecutively as a transitman, acting roadmaster and again as transitman until March, 1925, when he was promoted to roadmaster, as noted above.

J. B. Kelly, whose promotion to general roadmaster of the Minneapolis, St. Paul & Sault Ste. Marie, the Duluth, South Shore & Atlantic and the Mineral Range, with headquarters at Minneapolis, Minn., was reported in the March issue, was born on December 3, 1882, at Milbank, S. D., and attended the State University of Arkansas for two years ending June, 1899. He entered railway service in June, 1899, as a roadmaster's clerk on the St. Louis Southwestern, and served in this capacity on the St. Louis Southwestern and on the Kansas City Southern until December, 1900, when he became assistant extra gang foreman on the Minneapolis & St. Louis. From December, 1900, to August, 1902, he served in the consecutive capacities of assistant extra gang foreman, section gang foreman and extra gang foreman until August, 1902, when he was promoted to roadmaster at Monmouth, Ill. He served as roadmaster at Monmouth and at Mason City, Iowa, until April, 1909, when he entered the service of the Minneapolis, St. Paul & Sault Ste. Marie as a roadmaster at Minneapolis, Minn. He was promoted to assistant general roadmaster, system, in May, 1919, and general roadmaster of the lines east in January, 1925, which position he was holding at the time of his recent promotion to general roadmaster of the system and of the Duluth, South Shore & Atlantic.

J. B. Kelly

Purchasing and Stores

J. P. Murphy, general storekeeper of the New York Central, lines west, with headquarters at Collinwood, Ohio, has been given jurisdiction also over the Ohio Central lines, with the same headquarters. **E. H. Lehman**, general storekeeper of the Ohio Central lines, has been appointed assistant general storekeeper, with headquarters at Columbus, Ohio.

J. T. Kelly, district storekeeper of the Northern district of the Chicago, Milwaukee & St. Paul, with headquarters at Minneapolis, Minn., has been appointed chief stockman, with headquarters at Milwaukee, Wis., succeeding **H. L. Brillinger**, deceased. **G. T. Richards**, district storekeeper of the Southern district, has been transferred to the Northern district, with headquarters at Minneapolis, succeeding Mr. Kelly. **J. C. MacDonald** has been appointed district storekeeper of the Southern district, with headquarters at Dubuque, Iowa, succeeding Mr. Richards.

D. C. Curtis, general storekeeper, lines east, of the Chicago, Milwaukee & St. Paul, with headquarters at Milwaukee, Wis., has been promoted to chief purchasing officer, with headquarters at Chicago, succeeding **J. W. Taylor**, formerly vice-president in charge of purchasing and stores, who has retired from active service.

Obituary

George E. Potter, division engineer on the New York, Chicago & St. Louis, with headquarters at Fort Wayne, Ind., died in that city on April 8, from heart failure.

Aaron M. Burt, vice-president in charge of maintenance and operation of the Northern Pacific, with headquarters at St. Paul, Minn., died suddenly at Jamestown, N. D., on April 20 from an attack of pneumonia. He was stricken while on an inspection trip over the line. Mr. Burt was born on May 1, 1866, at Syracuse, N. Y., and entered railway service in April, 1885, in the engineering department of the Colorado Midland, now the Midland Terminal. Prior to December, 1896, he held various positions in engineering departments serving successively as division engineer on the Colorado Midland, the Northern Pacific, the Minneapolis, St. Paul & Sault Ste. Marie and the Chicago & North Western. He was appointed supervisor of bridges and buildings of the Northern Pacific in January, 1897, and was promoted to assistant superintendent, with headquarters at Grand Forks, N. D., on March 1, 1902. On October 10, 1923, he was promoted to division superintendent at Jamestown, N. D., and was subsequently transferred to Fargo, N. D., Missoula, Mont., and Spokane, Wash. He was promoted to chief engineer maintenance of way on January 1, 1914, and was promoted to acting general manager in April, 1918. He was appointed assistant general manager in August of that year and held that position until June, 1919, when he was appointed assistant director, Division of Operation, of the United States Railroad Administration, with headquarters at Washington, D. C. On March 1, 1920, he was appointed assistant to the vice-president in charge of operation of the Northern Pacific, with headquarters at St. Paul. He was promoted to assistant vice-president in 1923 and was elected vice-president in charge of maintenance and operation in January, 1925, succeeding J. M. Rapelje, who also died suddenly on January 20. Mr. Burt was a member of the board of direction of the American Railway Engineering Association at the time of his death.

Aaron M. Burt

A dedication ceremony was held in Topeka, Kan., on April 18, for a new general office building of the Atchison, Topeka & Santa Fe, which is the largest structure in the United States devoted exclusively to general offices of a single railroad company. The building is U shaped and 10 stories high, with a central unit 50 ft. by 150 ft., and two wings each 75 ft. by 150 ft., giving a total frontage of 300 ft. The building includes an 85 ft. by 175 ft. assembly hall on the tenth floor with a stage.

Construction News

The Asherton & Gulf has made application to the Interstate Commerce Commission for permission to construct an extension from Asherton, Tex., to Eagle Pass, a distance of 60 miles.

The Atchison, Topeka & Santa Fe has filed with the state of Texas an amendment to the charter of the Pecos & Northern Texas, a subsidiary of the Santa Fe, which provides for the construction of two branch lines, one to extend from Plainview, Tex., northwest to Friona, 68 miles, and the other from Plainview northeast to Silverton, 35 miles. This company will acquire control of the Elkhart & Santa Fe by the purchase of capital stock and by lease. This road has received a certificate from the Interstate Commerce Commission permitting it to construct a 56-mile line from Elkhart on the Kansas-Oklahoma state line southwesternly into Texas county and Cimarron county, Okla. This company plans to construct, jointly with the Union Pacific, the Los Angeles street railway, the Los Angeles County and the city of Los Angeles, a viaduct over the Los Angeles river and the railway tracks at Macy street, Los Angeles, Calif. The cost of the construction has been apportioned by the Railroad Commission of California, and the construction is to be undertaken soon. The viaduct will be of steel and concrete with a 25-ft. single arch span across the river. The Union Pacific tracks on the east side and the Santa Fe tracks on the west side are to be depressed under the bridge. The total cost is estimated at $600,000. This company will award a contract about February 1, 1926, for the erection of the through steel spans of the bridge across the Mississippi river at Fort Madison, Iowa. Company forces will place the nine 100-ft. double track girders for the railroad and the nine 100-ft. girders for the wagon road at the east end, as well as the nine 80-ft. double track girders and the nine 80-ft. girders for the wagon road at the west end. The contract to be awarded next year will be for the erection of four 270-ft. spans, a 184-ft. through span and a 534-ft. through draw span. The contract for the construction of the sub-structure of the bridge was awarded to the Union Bridge & Construction Company, Kansas City, Mo. This company has awarded a contract to the Sumner Sollitt Company, Chicago, for the construction of a one-story warehouse, 43 ft. by 250 ft., at Los Angeles, Cal.

The Baltimore & Ohio has awarded a contract to the Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., for the construction of improvements to the water station facilities at Keyser, W. Va., to cost approximately $35,000.

The Boston & Maine has been authorized to strengthen the line between Ayer, Mass., and East Deerfield (68 miles) which will cost approximately $125,000.

The Central of Georgia has awarded a contract to Fairbanks, Morse & Company, Chicago, for the erection of a coaling station, to cost about $30,000, at Union Springs, Ala.

The Central of New Jersey has awarded a contract to the Wilson & English Construction Company, New York, for the depression of this company's tracks through Perth Amboy, N. J., at a cost of approximately $750,000.

The Chesapeake & Ohio has awarded a contract for the construction of second track from Apex, Ohio, to Robbins, at a cost of $255,000, authorization for which was reported in the April issue, to the Hunt-Forbes Company, Huntington, W. Va. The contract for the construction of third track from Russell, Ky., to Riverton, at a cost of $210,000 has been awarded to Haley, Norris & Chittum, Charlottesville, Va.

The Chicago Great Western have taken bids for the constructure of a coaling station at Bristow, Iowa.

The Chicago, Burlington & Quincy jointly with the Colorado & Southern, will construct additional terminal facilities at Denver, Colo., if plans for the joint operation of their freight terminals in that city, which are being considered, are approved.

The Chicago, Milwaukee & St. Paul will undertake at once the elevation of the tracks at Mayfair, Chicago, the sum of $1,500,000 to defray the expense having been loaned to the St. Paul by the city of Chicago.

The Chicago, Rock Island & Pacific plans to construct a large freight terminal at Dallas, Texas, to be used jointly with the St. Louis-Southwestern and has awarded a contract to the Folwell-Ahlskog Company, Chicago, for the construction of a grain elevator at Council Bluffs, Iowa, to cost $200,000, as reported in the March issue.

The Colorado & Southern plans the construction of a seven-mile branch line from Wheatland, Wyo.

The Delaware, Lackawanna & Western has awarded a contract to the Arthur McMullen Company, New York, for the construction of piers for a new bridge over the Buffalo river at Buffalo, N. Y., at a cost of approximately $85,000.

The Denver & Rio Grande Western has applied to the Interstate Commerce Commission for authority for the construction of a branch line from Soldier Summit to Vernal, Utah, 131.6 miles, through the Uintah basin.

The Detroit, Toledo & Ironton plans improvements to be constructed this year to include second main track from Flat Rock, Mich., to Durban, a distance of approximately 16 miles, for which bids will be taken within a few weeks. Contracts for the grading of the cut-off from Durban, Mich., to Malinta, Ohio, a distance of 56 miles, will be awarded soon. Plans have been made for the construction of a 300-ft. reinforced concrete bridge over the Raisin river near Durban and for grade separation at Telegraph road, near Detroit.

The Florida East Coast has authorized initial work at Miller shops (north of St. Augustine); the construction of third building of the company's general office group at St. Augustine; the construction of a number of long freight receiving tracks at Fort Pierce freight terminal; the initial work on the construction of large freight terminals at Bowden near South Jacksonville, and at Hialeah near Miami; and the construction of 128 miles of second main track to be completed by January 1, 1926, in addition to the 68 miles now under construction.

The Fort Worth & Denver South Plains has applied to the Interstate Commerce Commission for authority to construct an east and west line from Carey through Plainview to the center of Castro county, Tex., 130 miles and a north and south line, crossing it at a point 22 miles east of Plainview, from Silverton to Lubbock, Tex., 53 miles. The line is to be constructed and operated as a part of the Colorado & Southern System in connection with the Fort Worth & Denver City.

The Great Northern has authorized the electrification of the line from Tye, Wash., to Skykomish, a distance of 25 miles. Plans have not been completed and it has not been decided whether the company itself will do the work or whether it will be carried out under contract. This company will soon ask for bids for the construction of an engine terminal at Troy, Mont., to cost $150,000, authorization for which was reported in the March issue. The terminal will include an enginehouse, machine shop and power house.

The Illinois Central has awarded a contract for the construction of a 1,200-ton reinforced concrete coaling station at Markham yard, Chicago, to A. M. Crain, Chicago.

The Indiana Harbor Belt has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the laying of approximately one mile of 10-in. pipe line.

The Kansas City, Mexico & Orient's plans for the rehabilitation of the Orient include the construction of an office building and depot at Wichita, Kan., at a cost of $85,000, and passing tracks at several points along the line, to cost $67,000. This company has been authorized to construct a 11½-mile extension of the Orient line in Mexico from Marquez, Chihuahua, toward the international boundary. The construction of this extension is the first step in the company's plan to eliminate gaps in its lines.

The Kansas City Terminal will construct a store building and approximately one mile of switch track by day labor at Kansas City, Mo., at a cost of $150,000.

The Los Angeles & Salt Lake has been ordered by the

Railroad Commission of California to prepare plans for the elimination, jointly with the Atchison, Topeka & Santa Fe, and the Los Angeles railway company, of the grade crossing of Santa Fe avenue and the tracks of the Los Angeles railway with the tracks of the Los Angeles & Salt Lake and the Santa Fe at the intersection of Butte street and Santa Fe avenue in Los Angeles, Cal. The separation of the grade is to be effected by the construction of a subway carrying Santa Fe avenue and the tracks of the Los Angeles railway under the tracks of the Los Angeles & Salt Lake and the Santa Fe. The cost of the project is estimated at $233,000.

The Los Angeles Harbor will soon take bids for the construction of a viaduct which will carry the highway and tracks of the Atchison, Topeka & Santa Fe, Union Pacific, and other railroads into the Los Angeles Harbor district. The viaducts will be of steel and concrete construction 80 ft. wide, and will cost $535,000. The plans are now in the hands of the Railroad Commission of California.

The Mexicali & Gulf has begun the construction of a line from Calexico, Cal., to the Gulf of California, a distance of 135 miles. The first unit from Calexico to LaBomba, Lower California, will be approximately 65 miles long. The remainder will be constructed at a later date.

The New York, Pittsburgh & Chicago incorporated in Pennsylvania on January 9, has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Allegheny to Easton, Pa., 283 miles, with a branch from Pittsburgh Junction to Pittsburgh, 30 miles, and one from Allegheny City to North Sewickley, 31 miles, making a total of 344 miles. It is proposed to cross the Susquehanna river about two miles north of Herndon. The company is represented by Henry O. Evans, Pittsburgh, and F. A. Molitor, of New York, is president.

The Northern Pacific has awarded a contract to Foley Bros., Minneapolis, Minn., for the construction of an extension to the ore dock at Superior, Wis. The extension will consist of 108 additional pockets, each having a capacity of 350 tons. The superstructure will be of reinforced concrete and the foundation of piling enclosed with a sand-filled crib.

The Oregon, California & Eastern has applied to the interstate Commerce Commission for authority for the construction of a line from the Sprague river to Silver Lake, Ore., 63 miles, with a 15-mile branch, and from the Sprague river to Lakeview, Ore., 65 miles.

The Owensboro, Rockport & Chicago has awarded a contract for the construction of its proposed 84-mile line from Owensboro, Ky., to Elinora, Ind., at a cost of $7,000,000, to Paul Meredith, Indianapolis, Ind.

The Pecos & Northern Texas has applied to the Interstate Commerce Commission for authority to construct an extension from Lider to Silverton, Tex., 30 miles.

The Pennsylvania has awarded a contract to the Vang Construction Company, Cumberland, Md., for the substructure of a bridge over the Chesapeake & Delaware Canal at Canal, Del., at an approximate cost of $240,000. This company has divided work on its new low-grade line from Canton, Ohio, to Bayard, into four sections for simultaneous construction. Contractors for grading and masonry on the four sections respectively, together with the approximate expenditure involved in each, are: A. Guthrie & Company, Inc., St. Paul, Minn.; Ferguson & Edmundson Company, Pittsburgh, Pa.; John F. Casey Company, Pittsburgh, Pa.; M. J. McMenamin, Philadelphia, Pa.; the total work to cost approximately $2,450,000.

The Rio Grande's charter has been amended to provide for the construction of an extension from Brownsville, Texas, to San Antonio, a distance of 275 miles, with a branch from Santa Elena to Rio Grande City, 40 miles, and another branch from Santa Elena to Falfurrias, 38 miles. The company now operates a 3 ft. 6 in. gage line from Brownsville to point Isabel, about 26 miles.

The Seaboard Air Line is reported to be contemplating the construction of an extension from Brooksville, Fla., to Inverness, a distance of approximately 20 miles.

The Southern has awarded a contract to Dwight P. Robinson & Company for repairing the extensive damage done by tornado to its shops at Princeton, Ind., and has awarded a contract to Fairbanks Morse & Company, Chicago, for a 300-ton steel coaling and sanding plant.

The Southern Pacific plans the enlargement of the yard at Marysville, Cal., at a cost of $125,000, according to press reports.

The Texas & Pacific has awarded a contract to the R & T Construction Company, Houston, Texas, for excavation and filling, involving approximately 180,000 cu. yd. of earth, for the new yard and engine terminal facilities at Alexandria, La., which are to be used by the Texas & Pacific and the Missouri, reported in the March issue.

Track Materials

The Atchison, Topeka & Santa Fe has divided an order for 12,300 tons of rails between the Inland Steel Company and the Illinois Steel Company.

The Chesapeake & Ohio has arranged for the purchase of 30,000 tons of rails, which will probably be placed in June.

The Southern Pacific has inquired for 5,100 tons of tie plates, 4,000 kegs of bolts and 18,800 kegs of spikes.

The Litchfield & Madison has ordered 2,000 tons of rails and 500 tons of angle bars, bolts and spikes from the Inland Steel Company.

The Wabash has divided an order for 5,000 tons of rail between the Inland Steel Company and the Illinois Steel Company.

Colonel Frank G. Jonah, chief engineer of the St. Louis-San Francisco, who served during the war as chief engineer of light railways in France, has received a Polish decoration in recognition of his service to the Allies during the war. The award included an official citation and a military medal.

The volume of freight carried by the railroads during the first three months of 1925 was the greatest ever handled by them during any corresponding period. According to reports compiled by the Bureau of Railway Economics, this traffic amounting to 70,560,495,000 net ton miles, which is an increase of 0.2 per cent over the corresponding period of 1924, which marked the previous high record.

The several gas and steam driven omnibusses now in service on the Chicago Great Western have led to the introduction of a new feature of railway terminal operation in the form of a gas-engine repair organization, which this company has found it desirable to create, consisting of men who are engaged entirely on gas-engine work, both for making heavy and light repairs. At Oelwein, Ia., a separate shop is being contemplated for the use of this organization.

The proposed lease of the Virginian by the Norfolk & Western has been approved by the boards of directors of the two companies. This proposed combination is at variance with a four-system plan recently formulated by the executives of the eastern district, under which the Norfolk & Western is assigned to the Pennsylvania and the Virginian to the greater Nickel Plate system, but it is considered in line with the Pennsylvania's interest in view among other things, of the statement of President Rea of the Pennsylvania to the effect that the lease of the Virginian to the Norfolk & Western is in accord with the consolidation plans outlined by the Interstate Commerce Commission.

In January, 1925, the average compensation of employees on a daily basis (not including overtime) was $7.71, as compared with $7.62 in January, 1924, and $7.52 a day in January, 1923. The average compensation of employees working on an hourly basis (not including overtime) was 59 cents in January, 1925, as compared with 58 cents in January, 1924, and 56 cents in January, 1923. The advances in daily and hourly wages resulted in employees receiving in straight time wages in October, 1924, $4,000,000 more than they would have received if the rates of pay had been the same as in the corresponding month of the preceding year; in November, $5,000,000 more; in December, $3,000,000 more, and in January, 1925, almost $4,000,000 more.

Supply Trade News

General

The Chicago Pneumatic Tool Company will construct a one-story addition to its plant at Los Angeles, Cal.

The Sellers Manufacturing Company, Chicago, will construct a one-story rolling mill 85 ft. by 160 ft. to cost $30,000.

The Mummert Lumber & Tie Company, Chicago, has opened a branch office in St. Louis, Mo., and has placed A. M. Martin in charge.

The Minwax Company, Inc., has removed its office from 18 East Forty-first street to 270 Madison avenue, New York City, and its Chicago district office has been removed to 10 East Huron street, Chicago.

The Ayer & Lord Tie Company's tie treating plant at North Little Rock, Ark., was damaged by fire to the extent of $350,000 on April 2. The company is now preparing plans for an entirely new structure.

The Truscon Steel Company, Youngstown, Ohio, will erect two warehouses in Buffalo, N. Y., on a piece of land 400 by 150 ft., at Bailey avenue and William street. One will be erected at once and another in the fall.

The National Paving Brick Manufacturers' Association in the quarterly meeting of the board of governors on March 17 elected **W. P. Whitney,** president of the Springfield Paving Company, Springfield, Ill., as president of the association. All other officers were re-elected.

The Brown Hoisting Machinery Company, Cleveland, Ohio, has made the following appointments in its sales organization: **J. P. Case,** sales manager; **J. F. Poland,** manager of Chicago office and **E. W Taylor,** manager of Pittsburgh office. In addition to his duties as sales manager Mr. Case will be in charge of Cleveland division sales.

The Harnischfeger Corporation, Milwaukee, Wis., will remove its Pittsburgh, Pa., sales office on May 1, from the Fidelity building to 612 Farmers Bank Building, Fifth avenue and Wood street. **A. J. Dreyer** is district manager and **M. B. Bradley** is sales engineer at this office. This company has appointed **A M. Lockett & Co.,** New Orleans, La., its agent in Louisiana and Mississippi.

The Ingersoll-Rand Company, New York, has perfected an arrangement with Carels Brothers, Ghent, Belgium, by which the latter company has acquired the right to manufacture Ingersoll-Rand solid-injection type oil engines. It is significant that Carels Brothers, who were among the first European licensees to operate under the Diesel patent, have now supplemented their line with oil engines of American construction.

Personal

C. B. Semple has been appointed Chicago representative of the **C. H. Whall Company,** Boston, Mass., with headquarters at 104 South Michigan avenue.

W. W. Glosser has been appointed general sales manager of the **Verona Tool Works,** Pittsburgh, Pa., and **Frank B. Nimmo** has been appointed assistant general sales manager.

Herman Green, president of the Adolph Green Construction Company, railroad contractors, with headquarters at Green Bay, Wis., was killed at that place on April 22, in an accident that occurred while he was directing the unloading of some construction equipment.

William C. Wolfe has been appointed district sales manager, welded and weldless division of the **American Chain Company, Inc.,** Bridgeport, Conn. Mr. Wolfe's headquarters are at 208 South La Salle street, Chicago. He succeeds **George C. Isbester,** resigned.

Lyle Marshall, former manager of the service department of the **Industrial Works,** Bay City, Mich., and later connected with the Chicago office, has been promoted to district sales manager in the newly opened office at 619 Dixie Terminal building, Cincinnati, Ohio. **James E. Shearer,** assistant sales manager, Bay City, Mich., has been transferred to New York.

Joseph M. Brown, formerly representing the W. F. Hebard Company, Chicago, has entered the sales organization of the **Chicago Malleable Castings Company,** Chicago, and will engage in the promotion of general sales. **Guy Bishop,** formerly sales representative of the Waugh Equipment Company has been appointed sales representative of the Chicago Malleable Castings Company, Chicago.

Charles D. Little, general manager of sales, has been elected vice-president in charge of sales and member of the board of the **Crane Company,** Chicago; he succeeds the late **E. H. Raymond. H. W. Seymour,** the branch manager at Baltimore, Md., has been elected general manager of sales to succeed Mr. Little and **Walter Evenson** was elected treasurer, **P. T. Kelly** continuing as vice-president in charge of finance.

Charles W. Beaver, sales manager of the **Yale & Towne Manufacturing Company,** has resigned, after nearly 25 years of service with that company, to spend a year in travel and recreation. **Schuyler Merritt,** vice-president of the company, has been elected chairman of the board of directors to succeed Henry R. Towne, deceased. **Addison Born,** assistant to the president and controller, has been elected treasurer, succeeding **J. H. Towne,** who still retains the office of secretary. **Gabriel S. Brown** has been elected a director.

R. H. Chappel has been elected treasurer and general manager of the **Standard Scale & Supply Corporation,** with general offices at Pittsburgh, Pa. This is a new corporation, which is entirely separate from the old Standard Scale & Supply Company, of Beaver Falls, now out of existence. The corporation manufactures railroad track and truck scales, narrow drum concrete mixers and also handles contractors' equipment in general. It has its own branch offices, warehouses and stores in Pittsburgh, New York, Philadelphia, Chicago and Cleveland.

Trade Publications

Inside Facts.—With aid of eight illustrations showing the interior construction of the various parts of the Thor portable electric drill the Independent Pneumatic Tool Company presents a detailed description of these drills and points out their particular advantage in an eight page folder. One page is devoted to a table of capacities, speeds, weights, etc., of the various models of the Thor drill.

Gravel Wall Wells.—Layne & Bowler Company, Memphis, Tenn., has issued a four-page folder illustrating and describing the gravel wall well system which this company has applied in railway water supply at a great many water stations in this country. In addition to descriptions and illustrations of the well itself and the special form of screen applied in connection therewith, tabular data were presented showing the relative flow which is to be had from gravel wall wells in comparison with other types.

Rock Drills.—The Sullivan Machinery Company has issued five new bulletins as follows: No. 80-A, covering diamond drills for gas engine drive; 81-E, a water hammer drill, 81-EA, a hammer drill for channeling or line drilling; 81-F, a rotator hammer drill, and 81-G, an air-feed, stoping drill. The diamond drill and the stoping drills described are new developments of the Sullivan company. The bulletins are prepared to give any one interested in these products the information desired in the most complete and compact form, each bulletin comprising what is essentially a descriptive article with suitable illustrations, tables, diagrams, etc.

What Is Manganese Steel?—The American Manganese Steel Company, Chicago Heights, Ill., has issued a four-page folder containing valuable information on manganese steel presented in an unusually condensed form. One page is devoted to a catechism of the nature and characteristics of this material while two pages comprise a listing of practically all of the uses to which manganese steel has been applied thus far. This listing is presented under an alphabetical classification covering all types of equipment and the various using industries with a listing under each heading of the particular parts of the equipment or the various types of devices for which manganese steel is definitely applicable.

STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of *Railway Engineering and Maintenance*, published monthly at Chicago, Ill., for April 1, 1925.

State of New York, }
County of New York } ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Edward A. Simmons, who, having been duly sworn according to law, deposes and says that he is the President of the Simmons-Boardman Publishing Company, publisher of the *Railway Engineering and Maintenance*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Simmons-Boardman Publishing Co., 608 South Dearborn St., Chicago, Ill.
Editor, Elmer T. Howson, Chicago, Ill.
Managing Editor, Walter S. Lacher, Chicago, Ill.
Business Manager, F. C. Koch, New York, N. Y.

2. That the owners are:
Simmons-Boardman Publishing Co., New York, N. Y. Names and addresses of stockholders owning 1 per cent or more of the total amount of capital stock: Edward A. Simmons, New York; Henry Lee, New York; Thomas Prosser & Son, New York; Roy V. Wright, Orange, N. J.; Samuel O. Dunn, Chicago, Ill.; Carrie E. Dunn, Chicago, Ill.; Lucius B. Sherman, Chicago, Ill.; Elmer T. Howson, Chicago, Ill.; Frederick H. Thompson, Cleveland, Ohio; Herbert L. Aldrich, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDWARD A. SIMMONS.
[SEAL] President.

Sworn to and subscribed before me this 30th day of March, 1925.

H. D. NELSON.

(My commission expires March 30, 1926.)

Buyers' Guide

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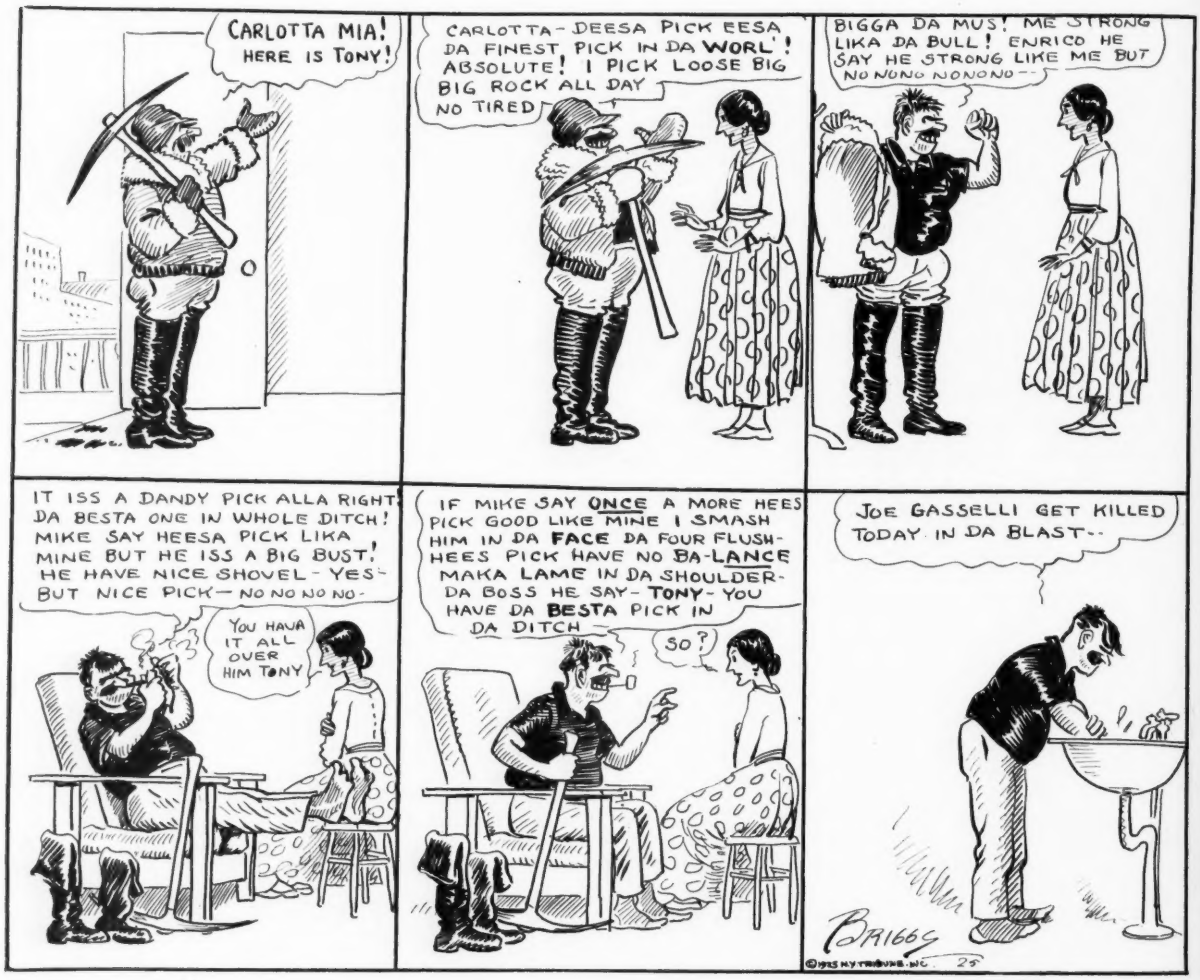
Real Folks at Home (The Ditch Digger) : By BRIGGS



BRIGGS does not tell us the make of Tony's pick; but the chances are that it is a Verona. A ditch-digger or a track-man feels the same enthusiastic affection for his Verona pick that an expert golfer feels for his mid-iron. That same enthusiasm extends to all Verona products—track tools, track jacks, shop tools, rail anchors, track circuit bonds, and rail joint springs.

If you were to "ask the man who uses them," he would point out his favorite tools and show you the Verona trade mark.

VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco New Orleans Washington St. Paul Denver